May 21, 1957 C. B. LEACH 2,792,820

CAMSHAFT AND FUEL PUMP DRIVE GEAR

Filed May 26, 1954 2 Sheets-Sheet 1

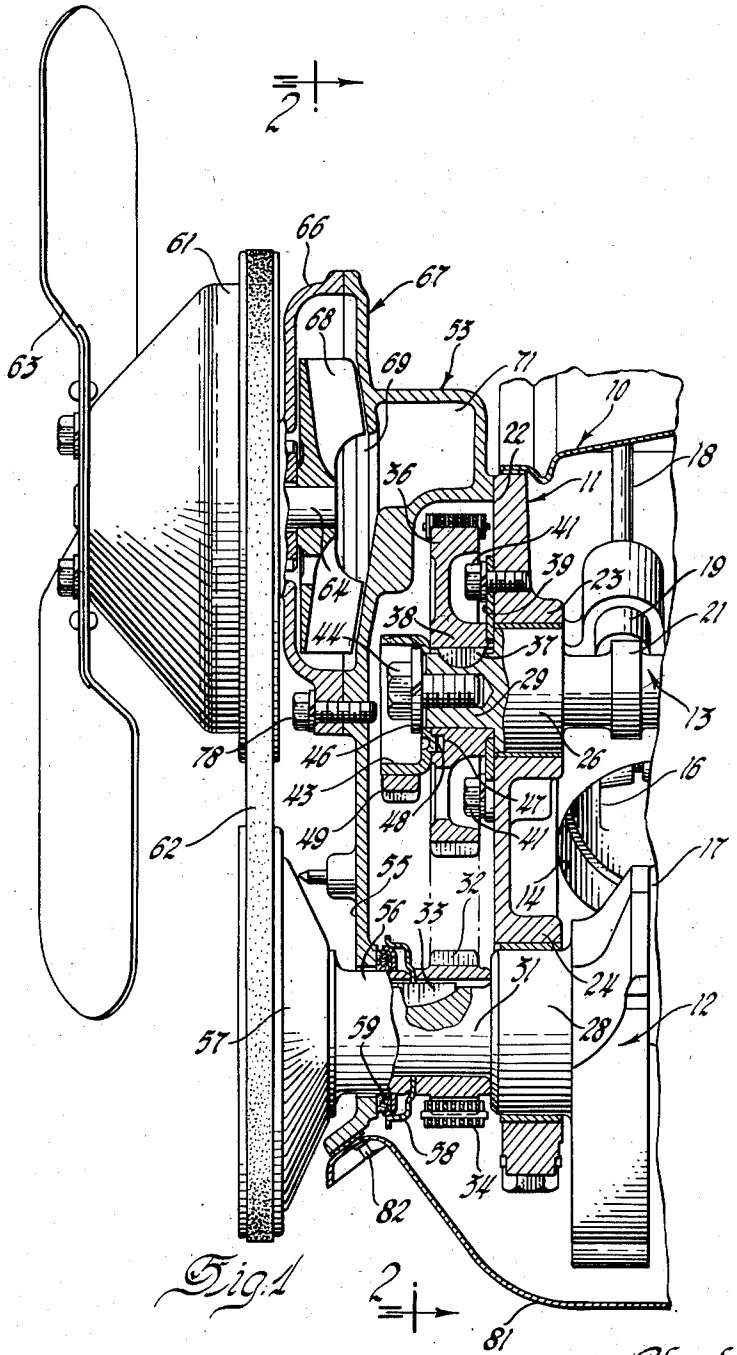


Fig. 1

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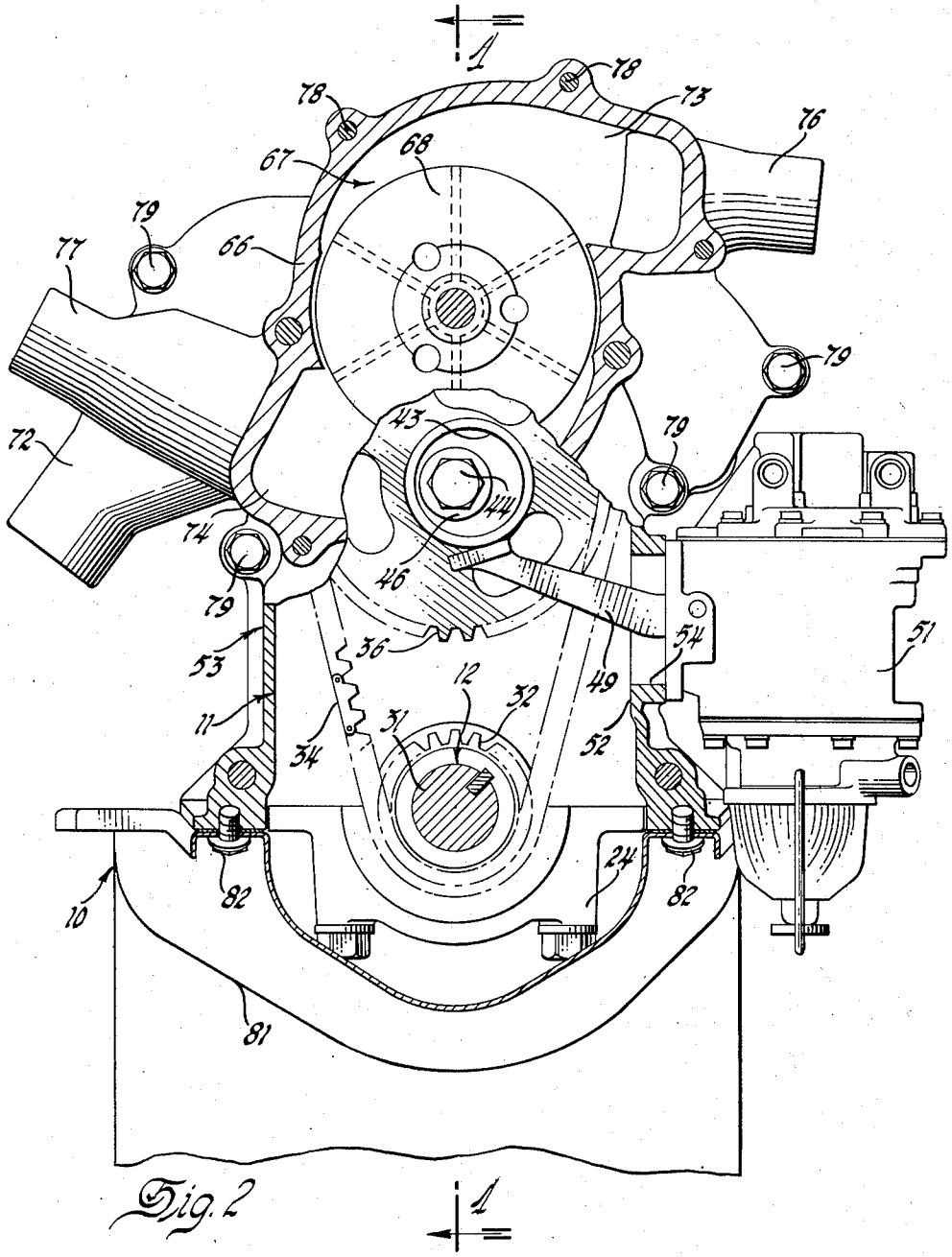


Fig. 2

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CAMSHAFT AND FUEL PUMP DRIVE GEAR

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6 Claims. (Cl. 123—195)

This invention relates to a combination drive means for shafts and levers, etc. and has particular relation to a driving means unit in which all parts of the structure can be easily assembled and disassembled from the front wall of the frame of a V type or other internal combustion engine for automotive or other uses.

It has been customary heretofore to locate the cooling liquid circulating pump, the cooling fan, the fuel pump and the mechanism for driving the camshaft on the front wall of an engine frame or block, where these devices can be driven either directly or indirectly from the end of the engine crankshaft which projects forwardly beyond the front wall of the engine. This structure sometimes has been constructed as a single unit or as a number of separate units but however constructed the structure has usually been excessive in length and weight, expensive to construct, difficult to assemble and disassemble and generally deficient for these and other reasons.

It is now proposed to construct the cooling liquid circulating pump, the air circulating fan, and the fuel pump for a V type or other engine as a single removable unit and to construct the camshaft and fuel pump driving means as separately constructed elements adapted to be assembled and to operate as a single unit on the end of the camshaft of the engine. The casing containing the cooling liquid circulating pump and employed in supporting the fan and the fuel pump is also employed as a cover for the driving means for the camshaft and the fuel pump.

In the drawing:

Figure 1 is a fragmentary side elevational view of a V type internal combustion engine with parts thereof broken away and shown in section to better illustrate the various features of the invention.

Figure 2 is a fragmentary front elevational view of the engine illustrated by Figure 1 and having certain parts of the structure broken away and shown in cross section to better illustrate the invention.

The engine 10 in which the invention is embodied comprises an engine frame 11 in which a crankshaft 12 and a camshaft 13 is employed. Cylinders 14 contain pistons 16 which drive the crankshaft through connecting rods 17. The valve mechanism of the engine is actuated by push rods 18 disposed on valve lifters 19 which are engaged by cams 21 on the camshaft 13. The frame 11 has an end or front wall 22 in which bearing supports 23 and 24 are provided for supporting bearings 26 and 28 for the front ends of the camshaft 13 and crankshaft 12 respectively. The camshaft 13 has a reduced end 29 and the crankshaft 12 has a reduced end 31, each projecting forwardly of the front wall 22 and beyond the bearings 26 and 28 respectively.

The reduced end 31 has a drive means or gear 32 secured thereto by a key 33 or other suitable means. The gear 32 drives a timing chain 34 which in turn drives a gear 36 adapted to be secured against rotation on the reduced end 29 of the camshaft 13 by any suitable means such as the key 37. The hub 38 of the gear 36 is adapted

to engage an annular shoulder formed between the reduced end 29 and the bearing 26 for axially supporting the gear 36 upon the end of the shaft 13. In order to provide a thrust bearing for the camshaft 13 the shoulder between the reduced end 29 and the bearing 26 may be disposed substantially in the plane of an adjacent part of the front wall 22. The hub 38 of the gear 36 may be formed to provide an annular shoulder disposed in opposed relation to the annular shoulder on the adjacent end of the bearing 36 and within which the inner peripheral edge of a thrust plate 39 may project. The thrust plate is provided with an opening therein for receiving the reduced end 29 and the end of the hub 38 within the groove by which the shoulder on the end of the hub is formed. The plate 39 may be secured to the wall 22 by screws 41 projecting through openings in the plate and into threaded openings in the wall 22. The heads of the screws 41 may be engaged by a wrench through openings formed in the gear 36 in directly opposed relation thereto. The hub 38 of the gear 36 is constructed in such a way that the width thereof is not as great as the length of the reduced end 29.

Secured on the reduced end 29 beyond the hub 38 of gear 36 is an eccentric or cam indicated at 43. The cam 43 is of thin wall construction and is open at one end for receiving a bolt 44 and a washer 46. The washer 46 is adapted to engage the end wall of the cam 43 around the opening therein. The bolt is adapted to be secured in a threaded opening formed axially in the reduced end 29. Clearance may be provided between the washer 46 and the reduced end 29 so that the bolt 44 can be securely tightened to compress the end wall of the cam 43 against the hub of the gear 36 and the hub of the gear 36 against the shoulder formed on the bearing 26. In order to prevent relative rotation between the cam 43 and the gear 36 it is proposed to provide a depression 47 in the hub of the gear 36 and a projection or detent 48 in the end wall of the cam 43 for engagement within the depression 47 when the bolt 44 is tightened.

For convenience in manufacturing it is apparent that the cam 43 may be constructed as a stamping made of sheet metal and the gear 36 may be a casting made of iron. It will be further apparent that both the eccentric cam 43 and the gear 36 are of simple construction and design, that these parts will not require excessive machining or finishing operation in order to provide satisfactory operation in an engine and that the parts can be assembled and disassembled on the camshaft 13 with simple tools and considerable ease.

The exterior surface of the cam 43 is adapted to engage a lever 49 for driving a fuel pump 51. The fuel pump 51 is adapted to be secured in any suitable manner to a side wall 52 of a casing 53 with the lever 49 projecting through an opening 54 in the side wall 52. The casing 53 is formed on one side thereof to provide a cover for the drive mechanism previously described and employed in driving the camshaft 13 and the pump 51. The casing 53 has a front wall 55 which is provided with an opening through which the reduced end 31 of the crankshaft 12 may project. Also oppositely projecting through the opening in the front wall 55 and surrounding the reduced end 31 is a tubular sleeve 56 on the outer end of which a drive pulley 57 is rigidly secured. A bolt and washer similar to the bolt and washer 44 and 46 or other suitable means may be employed in securing the pulley 57 to the reduced end 31 with the inner end of the sleeve 56 engaging a cap 58 within which a seal 59 is adapted to be compressed against the inner surface of the wall 55 and around the opening receiving the sleeve 56 and reduced end 31. The end of the sleeve 56 also

secures the gear 32 on the reduced end 31 against the shoulder formed by the end of the bearing 28.

It will be apparent that the pulley 57 and sleeve 56 can be removed from the reduced end 31 by removing the bolt from the threaded opening provided in the end of the reduced end of the shaft 12. When the pulley 57 and sleeve 56 are removed from the reduced end 31 it is apparent that it will be possible to remove the casing 53 from the end of the shaft 12.

The pulley 57 is adapted to drive a fan pulley 61 through a belt 62. The front end of the fan pulley carries the fan 63 for supplying air for cooling the engine 10. The fan pulley is supported by a shaft 64 that is supported in a bearing formed in a cover 66 for a cooling liquid circulating pump indicated generally at 67. The shaft 64 also drives an impeller 68 for the pump 67. The pump 67 has an axially disposed inlet 69 which is formed in the casing 53 beyond the impeller 68. The inlet 69 is supplied with cooling liquid by inlet passage 71 formed in the casing 53 above the timing gear mechanism previously described and having a connection 72 extending to one side of the casing 53 for convenient attachment to a hose connected to the radiator for the engine. The casing 53 and the cover 66 around the periphery of the impeller 68 may be formed to provide cooling liquid collecting chambers indicated at 73 and 74. The outlet chambers may be connected to outlet passages formed in the outlet couplings 76 and 77 for connection to hoses leading to the cooling fluid jackets for the cylinder heads of the engine 10. The cover 66 may be secured to the casing 53 by bolts indicated at 78.

It will be apparent that when the bolts 78 are removed the pump impeller 68, the fan pulley 61 and the fan 63 may be removed from the casing 53 and independently of the inlet connection 72 and the outlet connections 76 and 77.

The upper part of the casing 53 is adapted to be secured to the end wall 22 of the engine 10 by bolts such as those indicated at 79. The lower part of the casing 53 is adapted to be secured to the flanged front end of the oil pan 81 by bolts indicated at 82.

It will be apparent that the entire structure including the cooling liquid circulating pump 67, the fuel pump 51 and the casing 53 may be removed entirely from the engine by removing the pulley 57, the bolts 79 and the bolts 82.

It will also be apparent that the eccentric 43 and gear 36 may be removed from the shaft 13 merely by removing the bolt 44 and washer 46.

What is claimed is:

1. A drive device for engines having a crankshaft and a cam-shaft and a fuel pump for supplying fuel to be burned in operating the engine and comprising, a gear adapted to be secured on a reduced end of the camshaft and against a shoulder formed on said camshaft and having a hub thickness adjacent said reduced end substantially less than the distance between the end of said reduced end and said shoulder, a cam having an opening therein adapted to receive said reduced end of said camshaft extending beyond said hub of said gear, means for preventing relative rotation between said cam and said gear, and means for securing said cam against displacement from said reduced end of said camshaft and from engagement with said gear, said cam being adapted to engage a lever for operating said fuel pump of said engine.

2. A drive device for engines as defined by claim 1 and in which said hub of said gear adjacent said shoulder is provided with a concentric annular notch adapted to receive a thrust plate secured to the front wall of the block of said engine, said hub being adapted to engage one side of said thrust plate and said shoulder the other.

3. A drive device for engines having a driving and a driven shaft and an auxiliary apparatus to be driven by said driven shaft and comprising a first driving means adapted to be secured on a reduced end of said driven shaft and having a hub adapted to engage a shoulder adjacent said reduced end, said hub having a thickness substantially less than the length of said reduced end beyond said shoulder, a second driving means having an opening therein and being adapted to be secured upon said reduced end and against said hub with said reduced end projecting into said opening, means for securing said first driving means against rotation relative to said driven shaft, means for securing said second driving means against rotation relative to said first driving means, and means for securing said second driving means to said reduced end and against said first driving means.

4. A drive device for engines and the like comprising a shaft having an end and a shoulder adjacent said end, a cast drive member adapted to be secured on said end against said shoulder, means for securing said cast drive member to said shaft and against rotation with respect to said shaft, a sheet metal drive member adapted to be secured on said end adjacent said cast drive member, said cast drive member having a depression formed therein, said sheet metal drive member having a detent formed therein and in a position for the projection of said detent into said depression for securing said sheet metal drive member against rotation relative to said cast drive member, and removable securing means adapted to engage said sheet metal drive member for compressing said sheet metal drive member against said cast drive member and said cast drive member against said shoulder.

5. An internal combustion engine comprising an engine frame having a wall, a crankshaft and a camshaft rotatably mounted in parallel relation in said frame, bearing means on said wall adapted to receive bearing means on said camshaft for supporting said camshaft with an end projecting beyond said wall, bearing means on said wall for receiving bearing means on said crankshaft for rotatably supporting said crankshaft with an end projecting beyond said wall, said bearing means on said camshaft being formed to provide a radially extending annular shoulder disposed substantially in the plane of an adjacent surface on said wall and defining the inner extremity of said end of said camshaft, drive means secured on said end of said camshaft and engaging said shoulder for driving said camshaft, means associated with said end of said crankshaft for driving said drive means, and a plate secured to said wall for providing a thrust bearing for said camshaft, said drive means on said end of said camshaft and said annular shoulder on said bearing means on said camshaft being formed to provide an annular groove therebetween for receiving said plate within and throughout said annular groove, and means for removably securing said drive means to said end of said camshaft and against said annular shoulder.

6. An internal combustion engine comprising an engine frame having a crankshaft and a camshaft, bearing means in a wall of said frame for rotatably supporting said camshaft and said crankshaft in said frame, drive means secured on an end of said camshaft extending outwardly of said wall for driving said camshaft, means associated with said crankshaft and engaging the end of said crankshaft beyond said wall for driving said drive means, eccentric drive means secured to said camshaft beyond said drive means, a cover for said drive means and having an opening therein for receiving said end of said crankshaft, a cooling liquid circulating pump secured to the exterior of said cover, said cover being formed to provide passages forming the intake and discharge passages for said pump, means for driving said pump from said end of said crankshaft received in said opening in said cover, a fuel pump for supplying fuel for operating said engine secured on a side wall of said cover and radially outwardly of said eccentric drive means, a lever extending outwardly of said fuel

pump and through an opening in said side of said cover and engaging said eccentric drive means for driving said fuel pump, and means for removably securing said cover to said wall of said frame, said cover, said fuel pump and said cooling liquid circulating pump being removable as a unit from said frame by disconnecting said removable securing means from said wall of said frame and by disconnecting said cooling liquid circulating pump drive means from said end of said crankshaft and by axially moving said lever with respect to said eccentric drive means.

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