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(73) Proprietor : **LUCAS INDUSTRIES PUBLIC
LIMITED COMPANY**
Brueton House, New Road
Solihull, West Midlands B91 3TX (GB)

(72) Inventor : **Harris, Kenneth Maxwell**
15 Court Drive, Queens Road
Maidstone, Kent ME16 0JJ (GB)

(74) Representative : **Thompson, George Michael
et al**
MARKS & CLERK Alpha Tower Suffolk Street
Queensway
Birmingham B1 1TT (GB)

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Description

This invention relates to a liquid fuel pumping apparatus of the kind comprising a rotary distributor member mounted in a pump body and arranged in use to be driven in timed relationship with an associated engine to which it is intended to supply fuel, an annular cam ring surrounding the distributor member, the cam ring having cam lobes formed on its internal peripheral surface, for imparting inward movement to a pumping plunger mounted in a transverse bore in the distributor member in turn as the distributor member rotates, fuel being displaced from the bore during the inward movement of the pumping plunger and being supplied to the injection nozzles in turn of the associated engine, a fluid pressure operable piston for moving the cam ring angularly about the axis of rotation of the distributor member to adjust the timing of fuel delivery and coupling means connecting the piston with the cam ring said coupling means comprising a tooth like member engaged within a recess in the side wall of the piston.

The usual form of coupling means comprises a peg which is secured to the cam ring, the peg having a spherical end which locates in a circular recess in the side wall of the piston. The conventional practice is to secure the peg with a screw thread and to provide a complementarily threaded aperture in the cam ring into which the peg is screwed. The peg has to absorb the reaction force which is imparted to the cam ring as a cam follower associated with the plunger engages the cam lobes. As the pressure at which fuel is delivered to the associated engine is increased the reaction force is increased. The construction as described cannot be strengthened to any significant extent without substantial re-design of the apparatus and the object of the present invention is to provide a coupling means in a simple and convenient form.

US-A-3676023 discloses a pumping apparatus having a coupling means in the form of a plurality of spaced teeth formed on the cam ring, the teeth meshing with a plurality of spaced teeth formed in the side wall of the piston.

According to the invention in an apparatus of the kind specified the tooth like member is integral with a separate mounting having a pair of arms extending in opposite directions relative to the tooth like member, the arms being shaped for engagement with the outer peripheral surface of the cam ring and being individually secured to the cam ring.

An apparatus in accordance with the invention will now be described with reference to the accompanying drawing which is a sectional side elevation through part of the apparatus.

Referring to the drawing the apparatus comprises a body part 10 in which is journaled a rotary cylindrical distributor member 11 in which is formed a transversely extending bore 12. Surrounding the dis-

tributor member is the enlarged portion 13 of a drive shaft which is journaled within the pump body and which in use is driven in timed relationship with the associated engine. The distributor member is coupled to the drive shaft so as to be driven thereby.

Mounted within the bore 12 is a pair of pumping plungers 14 and intermediate the pumping plungers the bore is connected to a passage 15 which extends in known manner, axially within the distributor member. The passage 15 communicates with a delivery passage extending to the periphery of the distributor member and which can register in turn with outlet ports formed in the pump body and connected in use, to the injection nozzles of the associated engine. The passage 15 also communicates with a plurality of inlet passages which also extend to the periphery of the distributor member and which can register in turn with an inlet port connected to a source of fuel under pressure. In use, during inward movement of the plungers 14 the delivery passage will be in register with an outlet so that the fuel displaced during the inward movement of the plungers will be supplied to an injection nozzle of the associated engine. As the distributor member further rotates the delivery passage will move out of register with the outlet and an inlet passage will move into register with the inlet port and fuel will be supplied to the bore 12 to effect outward movement of the plungers. The quantity of fuel supplied to the bore may be controlled in order to vary the amount of fuel supplied to the associated engine alternatively some fuel may be spilled from the bore during the inward movement of the plungers for the same purpose.

The enlarged portion 13 of the drive shaft is provided with a pair of slots 16 which accommodate cam followers each cam follower comprising a shoe 17 and a roller 18. The rollers engage with the internal peripheral surface of an annular cam ring 19 mounted in the pump body and on the internal peripheral surface of which is formed a plurality of cam lobes 20. In order to vary the timing of fuel delivery to the associated engine the cam ring 19 is angularly adjustable and for this purpose a fluid pressure operable piston 21 is provided, the piston being mounted within a cylinder 22 to which fuel under pressure can be admitted to determine the position of the piston.

The cylinder 22 is tangentially disposed relative to the cam ring 19 and formed in the wall of the piston is a slot 23 into which projects a gear tooth shaped member 24 which is integrally formed with a mounting 25. The mounting 25 has a pair of arms 26 extending in opposite directions relative to the member 24, the arms being shaped to engage the peripheral surface of the cam ring and the arms are individually secured to the cam ring by means of set screws 27 respectively.

Conveniently and as illustrated, the peripheral surface of the cam ring is provided with a pair of mu-

tually inclined flats 28 and the arms of the mounting are shaped in a complementary manner. The mounting and the arms may extend the full width of the cam ring and the provision of the flats and the complementary surfaces on the arms 26 firstly provides for self location of the mounting relative to the cam ring and it also enables a proportion of the torque which is developed when the rollers engage the leading flanks of the cam lobes, to be transmitted to the member 24 by means of friction. It will be noted that the screw threaded apertures which are formed in the cam ring to receive the set screws, are formed in a portion of the cam ring between adjacent cam lobes. In order to enhance the transmission of torque the surfaces of the flats and/or the arms can be roughened or serrated.

The root portion of the gear tooth member 24 is machined to provide clearance with the side walls of the recess 23 when the piston is at its extreme positions but the tooth member as compared with the prior art peg, offers a substantially larger cross sectional area of material to resist the load which is applied during the operation of the apparatus. Furthermore, in order to minimise any problems which may arise due to misalignment of the piston, the tooth member 24 is barrelled.

Claims

1. A liquid fuel pumping apparatus comprising a rotary distributor member (11) mounted in a pump body (10) and arranged in use to be driven in timed relationship with an engine with which the apparatus is associated, an annular cam ring (19) surrounding the distributor member (11), the cam ring defining cam lobes (20) on its internal surface for imparting inward movement to a plunger (14) slidable in a transverse bore (12) in the distributor member (11) fuel being displaced from the bore (12) during successive inward movements of the plunger, a fluid pressure operable piston (21) for moving the cam ring (19) angularly about the axis of rotation of the distributor member to adjust the timing of fuel delivery and coupling means connecting the piston (21) with the cam ring (19) said coupling means comprising a tooth like member (24) engaged within a recess (23) in the side wall of the piston (21), characterised in that the tooth like member (24) is integral with a separate mounting (25) having a pair of arms (26) extending in opposite directions relative to the tooth like member (24), the arms being shaped for engagement with the outer peripheral surface of the cam ring (19) and being individually secured to the cam ring.

2. An apparatus according to Claim 1, characterised

in that said cam ring defines a pair of mutually inclined flats (28) against which the arms (26) are secured respectively.

3. An apparatus according to Claim 2, in which said arms (26) are secured by set screws (27) against said flats (28) respectively.

4. An apparatus according to Claim 2 or Claim 3, characterised in that the surfaces of the flats (28) and/or the surfaces of the arms (26) are roughened.

Patentansprüche

1. Flüssigkraftstoffpumpengerät mit einem Drehverteilterteil (11), das in einem Pumpenkörper (10) angebracht ist und in Benutzung so ausgelegt ist, daß es in zeitlicher Beziehung zu einem Motor angetrieben wird, mit dem das Gerät verknüpft ist, einem ringförmigen Nockenring (19), der das Verteilterteil (11) umgibt, wobei der Nockenring Nocken (20) auf seiner inneren Oberfläche definiert zum Ausüben einer Einwärtsbewegung auf einen Tauchkolben (14), der gleitend verschiebbar in einer Querbohrung (12) in dem Verteilterteil (11) vorgesehen ist, wobei Kraftstoff aus der Bohrung (12) während der sukzessiven Einwärtsbewegung des Tauchkolbens verdrängt wird, einem durch Fluiddruck betreibbaren Kolben (21) für eine Bewegung des Nockenringes (19) winkelmäßig um die Rotationsachse des Verteilterteiles zum Einstellen des Zeitpunktes der Kraftstofflieferung, und Koppelmittel, das den Kolben (21) mit dem Nockenring (19) verbindet und ein zahnartiges Teil (24) aufweist, das in einer Ausnehmung (23) in der Seitenwand des Kolbens (21) eingreift, dadurch gekennzeichnet, daß das zahnartige Teil (24) einstückig mit einer separaten Montierung (25) gebildet ist, die ein Paar von Armen (26) aufweist, die sich in entgegengesetzte Richtungen relativ zu dem zahnartigen Teil (24), wobei die Arme zum Eingriff mit der äußeren Umfangsoberfläche des Nockenringes (19) geformt sind, und individuell an dem Nockenring gesichert sind.

2. Gerät nach Anspruch 1, dadurch gekennzeichnet, daß der Nockenring ein Paar von gegeneinander geneigten Flächen (28) definiert, gegen die die entsprechenden Arme (26) gesichert sind.

3. Gerät nach Anspruch 2, in dem die Arme (26) durch Einstellschrauben (27) gegen die entsprechenden Flächen (28) gesichert sind.

4. Gerät nach Anspruch 2 oder Anspruch 3, dadurch

gekennzeichnet, daß die Oberflächen der Flächen (28) und/oder die Oberflächen der Arme (26) aufgeraut sind.

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Revendications

1. Appareil de pompage de carburant liquide comprenant un élément de distributeur rotatif (11) monté dans un corps de pompe (10) et arrangé, lors de sa mise en service, pour être entraîné en relation de synchronisation avec un moteur auquel l'appareil est associé, un anneau circulaire à came (19) entourant l'élément de distributeur (11), l'anneau à came définissant des lobes de cames (20) sur sa surface interne pour conférer un mouvement vers l'intérieur à un piston-plongeur (14) apte à coulisser dans un alésage transversal (12) pratiqué dans l'élément de distributeur (11), du carburant étant déplacé depuis l'alésage (12) au cours des mouvements successifs du piston-plongeur vers l'intérieur, un piston (21) mis en service par pression de fluide pour déplacer l'anneau à came (19) angulairement autour de l'axe de rotation de l'élément de distributeur pour corriger le réglage de l'alimentation en carburant, ainsi qu'un moyen de couplage reliant le piston (21) à l'anneau à came (19), ledit moyen de couplage comprenant un élément (24) en forme de dent qui vient s'engrener dans un évidement (23) pratiqué dans la paroi latérale du piston (21), caractérisé en ce que l'élément (24) en forme de dent est solidaire d'une structure séparée (25) comportant une paire de bras (26) s'étendant dans des directions opposées par rapport à l'élément (24) en forme de dent, les bras étant façonnés pour venir se mettre en contact avec la surface périphérique externe de l'anneau à came (19) et étant individuellement fixés à l'anneau à came.
2. Appareil selon la revendication 1, caractérisé en ce que ledit anneau à came définit une paire de méplats (28) mutuellement inclinés, contre lesquels les bras (26) sont fixés respectivement.
3. Appareil selon la revendication 2, dans lequel lesdits bras (26) sont fixés par des vis de réglage (27) contre lesdits méplats (28), respectivement.
4. Appareil selon la revendication 2 ou 3, caractérisé en ce que les surfaces des méplats (28) et/ou les surfaces des bras (26) sont rendues rugueuses.

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