

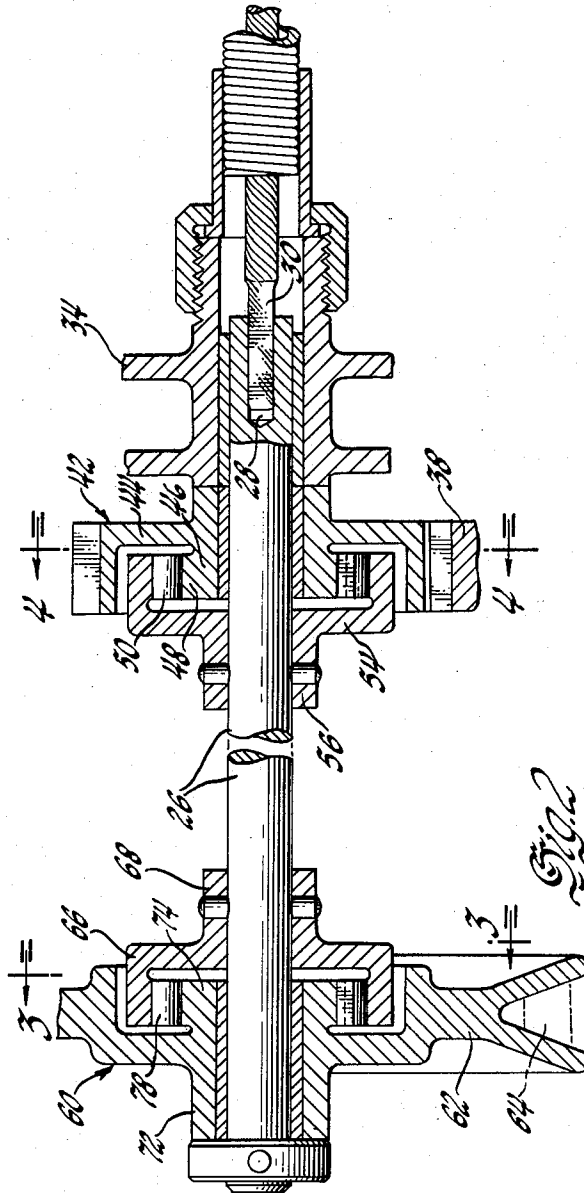
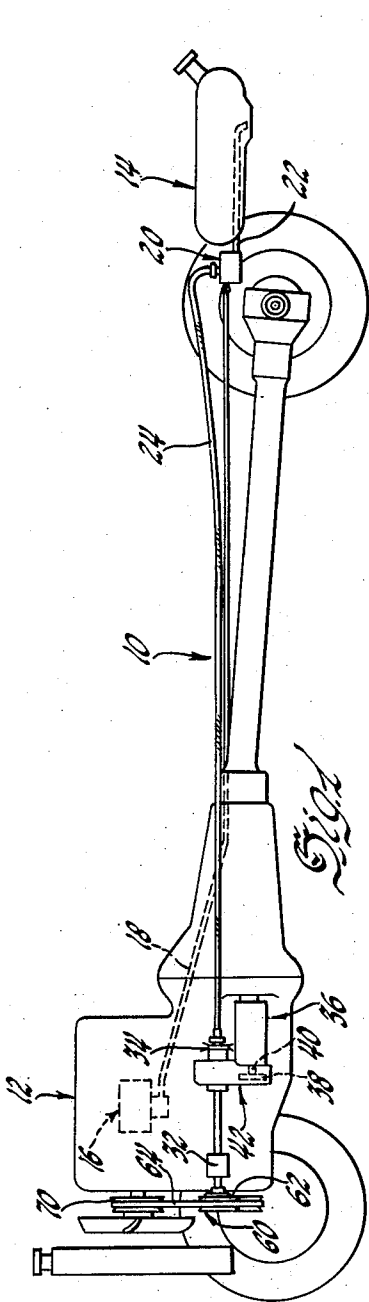
Sept. 15, 1959

J. ZUBATY
FUEL SUPPLY SYSTEM

2,904,027

Filed Dec. 13, 1957

2 Sheets-Sheet 1



INVENTOR.
Joseph Zubaty
BY
R. F. Barnard
ATTORNEY

Sept. 15, 1959

J. ZUBATY
FUEL SUPPLY SYSTEM

2,904,027

Filed Dec. 13, 1957

2 Sheets-Sheet 2

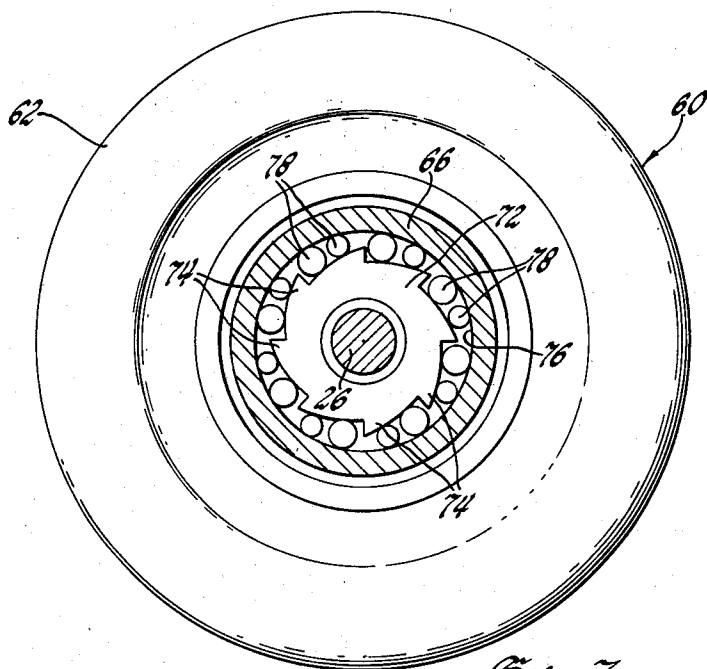


Fig. 3

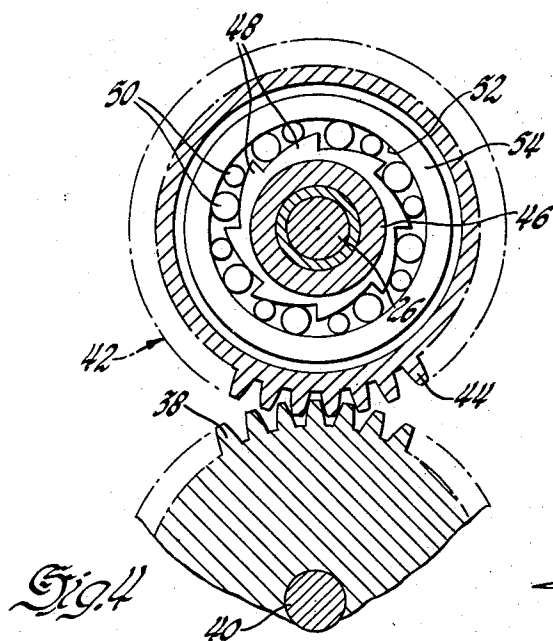


Fig. 4

INVENTOR.
Joseph Zubaty
BY
A. F. Barnard
ATTORNEY

1

2,904,027

FUEL SUPPLY SYSTEM

Joseph Zubaty, Flint, Mich., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application December 13, 1957, Serial No. 702,714

1 Claim. (Cl. 123—179)

The present invention relates to a new and improved fuel system in which it is possible to supply fuel under pressure through the location of a fuel pump adjacent or in the fuel supply tank and further which pump may be driven by the engine or engine accessories already available without requiring separate pump motor means.

Engine driven fuel pumps are old and in fact are typical of the type in current use today. However, such pumps are not capable of supplying fuel under more than a few pounds per square inch pressure. Such pumps are normally used solely for the purpose of transferring fuel from a fuel tank to a carburetor or other charge forming device. Thus during starting, for instance, there is no problem of such transfer or fuel pump supplying enough fuel since the carburetor will draw enough starting fuel from its own fuel reservoir. Thereafter as the vehicle is running the transfer pump will continue to supply low pressure fuel to the carburetor fuel reservoir.

Such fuel transfer pumps are, however, of no use with present and proposed fuel systems in which it is necessary to supply fuel under pressures of anywhere from 20 to 300 p.s.i. If, on the other hand, presently known type fuel pumps have their capacities increased sufficiently to supply fuel under pressure during cranking or starting, then such pumps will have greatly excessive capacity under normal running conditions which will necessitate the bypassing of considerable quantities of fuel during normal engine operation.

It is well known to provide pumps either adjacent or within the fuel tank for pumping fuel to the engine. In general these pumps have been of the electric type requiring their own individual motor means which have made them costly items to utilize on vehicles. It is, therefore, the purpose of the present invention to provide a fuel pump which may be located adjacent or within the fuel tank and which pump is uniquely driven to supply fuel under pressure to a suitable charge forming device. More specifically, it is an object of the present invention to provide such a pump which is normally driven by the engine but which is driven independently of the engine during starting conditions.

The objects of the present invention are realized by providing a pump driving mechanism which is adapted to be driven by the engine starting motor during cranking but which, through suitable clutching means, is adapted to be driven by the engine once the latter begins to function. In this way it is possible to provide a pump capable of delivering fuel under suitably high pressures through the utilization of power mechanisms already available and necessary for normal engine operation. The provision of a drive mechanism including a pair of simple clutch members makes it possible to provide a simple and economical pressurized fuel supply system.

Other objects and advantages of the present invention will be apparent from a perusal of the detailed description which follows.

In the drawings:

Figure 1 shows a vehicle embodying the subject invention;

2

Figure 2 is an enlarged sectional view of the pump driving mechanism;

Figure 3 is a sectional view along line 3—3 of Figure 2; and

Figure 4 is a sectional view along line 4—4 of Figure 2.

A vehicle is shown generally at 10 and includes an engine 12, a fuel tank 14 and a device 16 for supplying a combustible mixture of fuel and air to the cylinders of the engine. Device 16 may be a conventional carburetor in which a common combustible mixture is supplied through a manifold to the cylinders or it may be a device in which fuel is individually metered to each cylinder. A conduit 18 is adapted to deliver fuel from the fuel tank to the charge forming device 16.

In order to pressurize the fuel any well known type of relatively high pressure pump is provided at 20. Pump 20 may either be disposed immediately adjacent the fuel tank 14 as shown in Figure 1 or, if preferred, within the gas tank. In the illustrated embodiment, pump 20 is connected at its output side to fuel conduit 18 and at its input side to a conduit 22 feeding from tank 14. A flexible drive shaft 24, of any well known type, is suitably coupled at one end to pump 20 and at its other end to a rigid shaft 26. The rear or right end of shaft 26 includes a recessed portion 28 having a polygonal cross section into which a correspondingly shaped end of a flexible drive cable 30 is adapted to fit.

Shaft 26 is rotatably supported on the engine 12 through journal bearings 32 and 34.

An engine starting motor 36 is disposed proximate bearing 34 and includes a gear member 38 driven from motor shaft 40. The starting motor, when energized, is adapted, through gear 38 and an overrunning clutch device 42, to drive the flexible cable 30 and in turn the fuel pump 20 to provide fuel under pressure to the charge forming device 16 when the engine is being started.

The overrunning clutch device 42 includes a ring gear member 44 journaled for rotation on shaft 26 and adapted to externally mesh with starter motor gear 38. The hub 46 of gear 44 provides the driving member of the overrunning clutch and includes a plurality of inclined surfaces 48 on its outer periphery. Ball or roller members 50 are adapted to be disposed on the inclined or wedged surfaces 48 and in turn are adapted to cooperate with a concentrically disposed inner surface 52 of a clutch output member 54 which is fixed through its hub 56 to shaft 26. Thus as viewed in Figure 4, when starter motor 36 is energized member 44 will rotate in a counterclockwise direction causing the rollers 50 to be wedged between the inclined surfaces 48 and the coacting surface 52 of member 54. In this way the members 44 and 54 are locked together and drive is transmitted to shaft 26 and in turn to the flexible cable 30.

Inasmuch as the starter motor 36 is operative only during the cranking period, an additional overrunning clutch device, indicated generally at 60, is provided. Clutch 60 includes a pulley 62 adapted to be driven in any convenient way from an output member of the engine such as by fan belt 64. The engine driven clutch device 60 is essentially of the same construction as starter motor clutch device 42. Referring more specifically to Figure 3 it will be seen that an outer clutch member 66 is fixed through its hub 68 to shaft 26 and is the driving or input member of this clutch arrangement when the starter motor is operative. When the starter motor 36 is cranking or turning over the engine, the pulley 62 is being driven at too slow a speed to provide an adequate drive for the pump 20.

Accordingly, under these circumstances it is desired that the engine pump driving device including pulley 62, belt 64 and a second pulley 70 be operatively discon-

nected from the pump driving mechanism until the engine begins to run at least at idling speed. This is achieved by rotatably supporting pulley 62 on the shaft 26 so that the latter may rotate relative thereto. The hub 72 of pulley 62 includes the peripherally disposed wedge surfaces 74 between which and the inner surface 76 of member 66 roller or ball members 78 are disposed. Thus, when the starter motor 36 is providing the power to drive pump 20, clutch member 66 will be rotating in a counterclockwise direction, as viewed in Figure 3, preventing the balls or rollers 78 from wedging and thus transmitting drive between the members 62 and 66.

However, when the engine begins to run, and starter motor 36 becomes inoperative, the inner clutch member 72 is then driven through belt 64 faster than outer member 66 is rotating causing the rollers 78 to wedge against the inner surface 76 of member 66 transmitting drive to shaft 26. At the same time, within the clutch device 42, the outer clutch member 54 now becomes the input member causing rollers 50 to become unwedged permitting member 54 to overrun the inner member 46. In this way clutch device 42 disconnects the drive connections between shaft 26 and the starter motor 36. By this arrangement of clutches it will be seen that the transition is made from a starter motor drive to an engine drive with respect to pump 20.

By proper selection of the sizes of gears 38 and 44 as well as pulley 62 it is possible to determine the speed at which the flexible cable 30 and hence the pump 20 will be driven. For instance, in the case of the starter motor drive, which in general is low speed, it might be desirable to select gears 38 and 44 to multiply the rotative speed supplied by motor 36 to insure adequate fuel pressure for starting purposes. On the other hand, since the engine speed is a relatively high value it might be desirable to provide a speed reduction from the engine to clutch pulley 62.

I claim:

A fuel system for an internal combustion engine comprising a fuel tank, a charge forming device, a conduit connecting said fuel tank and said charge forming device, pump means for pressurizing the fuel in said conduit, drive means for said pump, a starter motor for said engine, a first one-way clutch device for transmitting drive from said starter motor to said pump drive means when said motor is operative, and a second one-way clutch device for transmitting drive from said engine to said pump drive means when said engine becomes operative, said clutch devices being arranged so that only one drive transmitting connection to the pump drive means is operative at one time, said pump drive means including a flexible cable connected at one end to said pump, a shaft member, the other end of said cable being fixed for rotation with said shaft, a first element of the first clutch device fixed to said shaft, a second element of the first clutch device operatively connected to the starter motor, means adapted to drivingly connect said first and second elements, a first element of said second clutch device fixed to said shaft, a second element of said second clutch device operatively connected to the engine, and means adapted to drivingly connect said latter first and second elements.

References Cited in the file of this patent

UNITED STATES PATENTS

1,439,483	Ritter	Dec. 12, 1922
2,114,249	Horton	Apr. 12, 1938
2,741,186	Nallinger	Apr. 10, 1956

FOREIGN PATENTS

414,839	Great Britain	Aug. 16, 1934
---------	---------------	---------------