

“AUTOMATIC PRIMING AND FILTERING IN DIESEL ENGINE”

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ABSTRACT

A fuel system and method for priming a diesel engine fuel system after assembly or when run out of fuel in which the system has a filter that can trap air allowing drain back of fuel to the tank. The system is primed by reverse flow of fuel from the priming connection through the filter to the fuel tank to virtually eliminate trapped air from the system. The engine may then be started with a minimum of cranking. It was manually done by plunger pump with help of hand by pushing rapidly. Automatic priming and filtering in diesel engine will be done by our concept. At first it was manually done by pumping with hands by one labour which takes so much efforts as well as time.

Keyword : - Priming, Filtering, Autonomous.

1. INTRODUCTION

As the name "Automatic priming and filtering in diesel engine", indicates the main point of our task that is to automatically priming in diesel engine. The present invention overcomes the prior problems by assembling the entire fuel system without fuel and then, through a reverse flow process, priming the entire system. The entire system is reverse-primed, leaving little or no trapped air in the fuel filter, thereby providing a liquid lock on the high spot of the system. This prevents the flow of fuel back into the fuel tank when the engine is shut off and allows quick restarts with no air being ingested by the injection pump.

To provide for reverse priming, a priming line is connected to a connector at the inlet of the fuel injection pump. The priming line is provided with a closure, preferably a mechanically open able check priming valve of the type used for filling and maintaining air pressure in tires, such as a Schroeder valve. The valve allows fuel to be forced into the priming line and to flow to the injection pump and also back through a delivery line to the filter housing. All air is thus forced out of the housing through the top inlet as the fuel continues through the feed line to the fuel tank.

In case a vehicle runs out of fuel in normal operation, the engine may be restarted upon replacement of a small amount of fuel in the tank. This is accomplished by mechanically holding open the priming valve while the in-tank fuel feed pump is operated. When fuel reaches the priming valve, the valve is closed and the engine may be restarted. If necessary, any remaining trapped air may be removed later by reverse priming of the system as before described.

These and other features and advantages of the invention will be more fully understood from the following description of a particular embodiment of the invention taken together with the accompanying drawing.

1.1 Aim and Objects

Aim: We chose the point for computerization into the field of car. We are going to make the automatic priming utilized as a part of auto mechanical production system automatically.

Objects: The main objective of this project is to priming automatically and increase the production rate to decrease the car assembles time, effort and cost. Automatic priming done with the help of pneumatic system.

1.2 Priming

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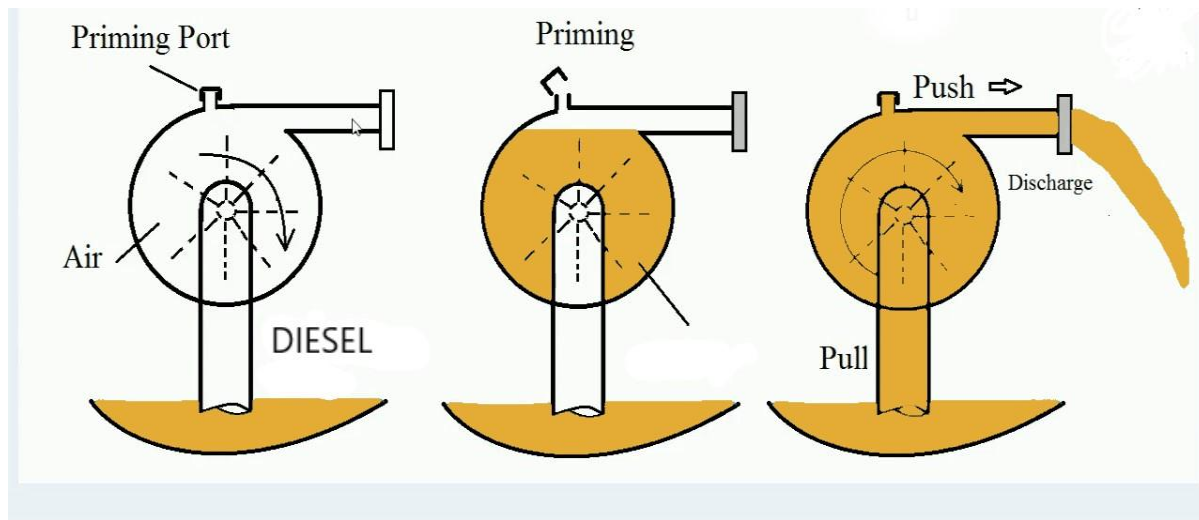


Fig.1: priming of pump

Priming gadget for injecting fuel by physically real means from a fuel supply into the mixing section of a carburettor or at some other area of the induction arrangement of an internal burning engine for engine starting purposes. It is essential that the word liquid is intended to include both fluid and gases. Air is a liquid. We could state that we are living at the base of an ocean of air called the environment. Air has weight so the climate applies a weight on the world's surface and everywhere throughout the surface of articles on the earth. The weight in a tire is higher than environmental weight.

1.3 method of priming

- If the fluid is higher than the pump then gravity ensures that fluid flows into the pump, pushing the air out.
- When fluid is supplied by a hydrant, mains pressure is sufficient to force fluid into the pump, pushing the air out.
- If the fluid supply is lower than the pump an extra piece of equipment is required. This is called a primer and its job is to remove the air from inside the pump, reducing the pressure so that atmospheric pressure will force fluid into the pump.

2. LITERATURE REVIEW

CATERPILLAR INC., ILLINOIS have published the research paper on “Fuel delivery system for selectively providing fuel to various engine components” in 2012 on the basis of that they have concluded “A system for providing fuel to an engine fuel delivery system and to an exhaust after treatment system associated with an engine. The system includes a fuel source, a pump being operable in a first state to pump fuel from the fuel source to the engine fuel delivery system, and the pump being operable in a second state to pump fuel from the fuel source to the exhaust after treatment system, wherein the first state corresponds to a first rotational direction of the pump and the second state corresponds to a second rotational direction of the pump.” [1]

HINO JIDOSHA KOGYO KABUSHIKI KAISHA, 3-1-1, HINODA have published research paper on “Automatic air bleeding device for fuel feed system of diesel engine” in 1991 on the basis if that they have concluded “A check valve is disposed in a suction-sideline of a feed pump in a fuel feed system and permits the fuel to direct only toward a feed pump; a bypass line is provided for bypassing the check valve; and a pump is disposed in the bypass line.

Alternatively, a line is branched from the suction side line of the feed pump in the fuel feed system and is communicated with a gallery chamber within the feed pump; a check valve is disposed in the branched line to direct the fuel only flowing toward the gallery chamber line; and a pump is disposed in the branched line upstream of the check valve. As a result, when air intermixes in the fuel feed system, the pump is energized prior to starting the engine to force the fuel having the air bubbles entrained therein through the feed pump into a fuel tank, thereby accomplishing air bleeding operation.”[2]

FORD GLOBAL TECHNOLOGIES, INC. A MICHIGAN CORP. have published research paper on “System for removal of water from diesel fuel systems” in 1987 on the basis of that they have concluded “An automotive type diesel engine provided with a conventional fuel filter water separator has a solenoid operated drain or dump valve for removing liquid contaminant/water automatically when the contaminant or water reaches a predetermined level actuating a sensor. The removed contaminant or water is then inducted into the engine by means of a venture/aspirator which in one embodiment has an outlet connected directly to the engine intake manifold to provide the necessary pressure drop or, in another turbocharged diesel engine embodiment, the boost pressure is connected to the inlet of the venture/aspirator to again induct the liquid contaminant/water into and through the aspirator to be disposed of in the exhaust system of the engine, both embodiments thereby automatically providing for a complete disposal of liquid contaminant/water within the engine and thereby eliminating the need of a periodic draining of the same from the fuel filter by the vehicle operator.”[3]

CUMMINS ENGINE COMPANY, INC., INDIANA have published research paper on “Automatic water drain and priming pump for fuel systems ” in 1996 on the basis of that they have concluded “An automatic water drain and priming pump for a fuel system in which a reversible pump is operable in a first direction to pump separated water out of a fuel filter and into a water drain, and further operable in a second (opposite) direction to pump fuel into the fuel filter in order to prime the fuel pump. Operation of the pump in the first direction to drain water from the fuel filter is initiated by water-in-fuel sensors within the fuel filter. Operation of the pump in the second direction to prime the fuel pump is initiated by manual activation of a switch during servicing of the fuel filter.”[4]

CUMMINS FILTRATION INC., TENNESSEE have published research paper on “Automatic switching duplex filter head and diesel fuel conditioning system ” in 2002 on the basis of that they have concluded “An apparatus for conditioning fluid. In one embodiment of the present invention, there is an apparatus which comprises two filters and an electrically possible switching valve. Fluid provided to the apparatus may be routed to either filter by the switching valve. A controller positions the valve to provide fluid to a particular filter based on a measurement of pressure downstream of the filter, provided that the temperature of the fluid is above a predetermined level. Further, the invention includes proximity switches by which the controller can determine the coupling or uncoupling of a filter ram the body. Various fuel heaters are provided for heating the fuel.” [5]

GENERAL MOTORS CORPORATION, MICHIGAN have published research paper on “Diesel engine fuel system and method of priming” in 1997 on the basis of that they have concluded “A fuel system and method for priming a diesel engine fuel system after assembly or when run out of fuel in which the system has a filter that can trap air allowing drain back of fuel to the tank. The system is provided with a fuel priming connection to the injection pump inlet, the connection having a closure for shutting the connection when not in use. A mechanically open able check valve, such as a Schrader valve, is a preferred form of closure. The system is primed by reverse flow of fuel from the priming connection through the filter to the fuel tank to virtually eliminate trapped air from the system. The engine may then be started with a minimum of cranking. The engine may be restarted after running out of fuel by partially filling the tank and operating the normal feed pump while bleeding air from the system through the priming connection, which is closed prior to engine starting. The engine may then be reframed after shutdown if required.” [6]

MAHINDRA & MAHINDRA LTD., INDIA have published research paper on “Self air-bleeding fuel supply system for a diesel engine with gravity primed fuel feed pump” in 2003 on the basis of that they have concluded “A self air-bleeding fuel supply system for a diesel engine with gravity primed fuel feed pump to facilitate automatic priming of fuel feed pump and to completely eliminate manual operations involved for removal of entrapped air and to prime the fuel feed pump on refuelling after complete utilizing fuel from the fuel tank.”[7]

3. METHODOLOGY

3.1 Selection of Mechanism and Process

System selection is mainly based on their performance as well as our requirement. According to that we can choose from hydraulic and pneumatic system.

- In our domain we require high velocity of piston movement and no need of high pressure due to that pneumatic system is more preferable for the mechanism.
- Pneumatic piston- cylinder is use to give reciprocating motion to the pump to fill the fuel in diesel lines.
- A double acting cylinder requires compressed air for every direction of movement. On this type of cylinder, the force both advancing and retracting direction is built up using compressed air.

Various mechanisms are available in the market. This might be selected as per the requirement.

4. BASIC COMPONENTS OF THE SYSTEM

4.1 controller



Fig.2: controller

The microcontroller is conceded with getting data from and to its own pins; the architecture and instruction set are optimized to handle data in bit and byte size. ATmega16 is an 8-bit high performance microcontroller of Mega AVR family with low power consumption. Atrnega16 can work on a maximum frequency of 16MHz. ATmega16 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 By its. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively. Fuse Bits the AVR microcontroller (AT mega 16) consists of sixteen fuse bits which are classified as low fuse and high fuse. These Fuse bits can be configured to select the microcontroller clock options or to control some in-built peripherals like JTAG, SPI etc.

4.2 Pneumatic System and Solenoid valve

4.2.1 Pneumatic system

The pneumatic system is a mechanical device deals with the applications of compressed air in the automation. The system includes a cylinder which is controlled by a solenoid valve. The pneumatic cylinder needs air pressure through air compressor to operate and pneumatic cylinder needs enclosed fluids (air) to operate.

Which has bore diameter of 20mm and stroke length of 45mm.pnumatocylinder must be in square shape.



Fig.3: pneumatic system

4.2.2 Solenoid valve

A solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid: in the case of a two-port valve the flow is switched on or off; in the case of a three-port valve, the outflow is switched between the two outlet ports. Multiple solenoid valves can be placed together on a manifold.

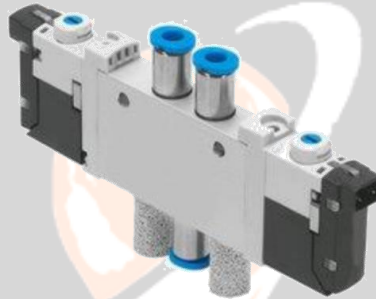


Fig.4: solenoid valve

Solenoid valves are the most frequently used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix fluids. They are found in many application areas. Solenoids offer fast and safe switching, high reliability, long service life, good medium compatibility of the materials used, low control power and compact design.

5. CONCLUSIONS

This project concludes the reduction in time of priming of car making by converting the manual process of priming, automatically. It also reduces the effort as well as causes of human errors and accurate priming in lesser time. It also eliminates the requirement of skilled workers.

Basically priming is done manually initially. We have provide automation to the system and whole the process done automatic. So due to that it can reduce time taken by the system, it does not require more human effort. It is portable and compact in size, so we can move it easily.

6. REFERENCES

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