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LUCAS

Quality

EQUIPMENT

WORKSHOP INSTRUCTIONS

ELECTRIC FUEL PUMP

MODEL 2FP

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ELECTRIC FUEL PUMP

MODEL 2FP

1. GENERAL

(a) INTRODUCTION

The prevention of vapour locking troubles in automobile fuel systems is a problem which has become prominent with the advent in recent years of higher volatility fuels, coupled with the growing use of motor vehicles in all parts of the world. Vapour locking is particularly troublesome on the suction side of a fuel system. It follows, therefore, that a most effective counter-measure is to locate a pump below the surface level of the fuel as shown in Fig. 1. When located thus, no vacuum can occur on the intake side of the pump which, being gravity fed with liquid fuel, can maintain its rated pressure on the delivery side. This is the working principle of the Lucas Electric Fuel Pump, Model 2FP.

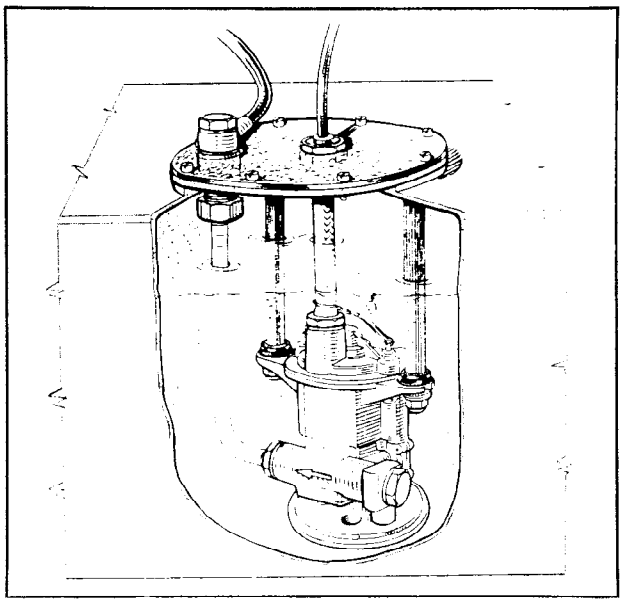

Fig. 1

Typical submerged pump installation with filtered inlet near bottom of tank and unit secured to cover plate by two rod supports

(b) APPLICATION

Besides its specific application to automobile fuel systems, Model 2FP is a general service fuel pump designed for use with petrol (gasolene), paraffin (kerosene), diesel (gas) and lubricating oils. Other applications include fuel booster and fuel transfer pumps in aircraft.

Since it is frequently used in connection with inflammable fuels, the application of this pump has always to be considered jointly in detail by Lucas and the customer.

(c) DESCRIPTION

(*i*) As shown in Fig. 2, Model 2FP is a composite unit containing, within a single body and between two end covers,

a permanent magnet field electric motor, and an impeller-type pump, having both intake and delivery ports at the periphery of the impeller.

(*ii*) The body and end covers are of zinc pressure-die-cast construction and integral mounting lugs provide two-hole fixing through fuel-proof rubber grommets. A special washer provides an earthing path from the pump unit to its mounting, so preventing the building up of electrostatic charges on the unit. While the pump has been designed for mounting in the fuel tank, it may be adapted for mounting either adjacent to the fuel tank or in-line, as required.

(*iii*) The insulated-return motor has a high energy permanent magnet field system for simplicity, reliability and robust construction. A twin-cored P.V.C.-covered supply cable passes from a sealed terminal moulding in the motor and through a fuel-proof outlet union. When the unit is mounted inside the fuel tank, the cable passes through armour-braided tubing with fuel-proof unions at the pump and tank outlets, resulting in complete metal-encasement of both motor and cable within the tank.

(*iv*) By virtue of its design, the pump develops more pressure than a conventional centrifugal pump. A moulded fluted impeller floats axially on the motor armature shaft and is driven by a cross peg in the shaft. Thus there are only two running bearings, one at each end of the armature shaft. Both the armature shaft and peg are of stainless steel. The armature runs at approximately 3,000 r.p.m. according to the voltage and load. An adjustable relief valve, consisting of a stainless steel ball and spring, is provided in the pressure chamber and may be adjusted to suit individual requirements.

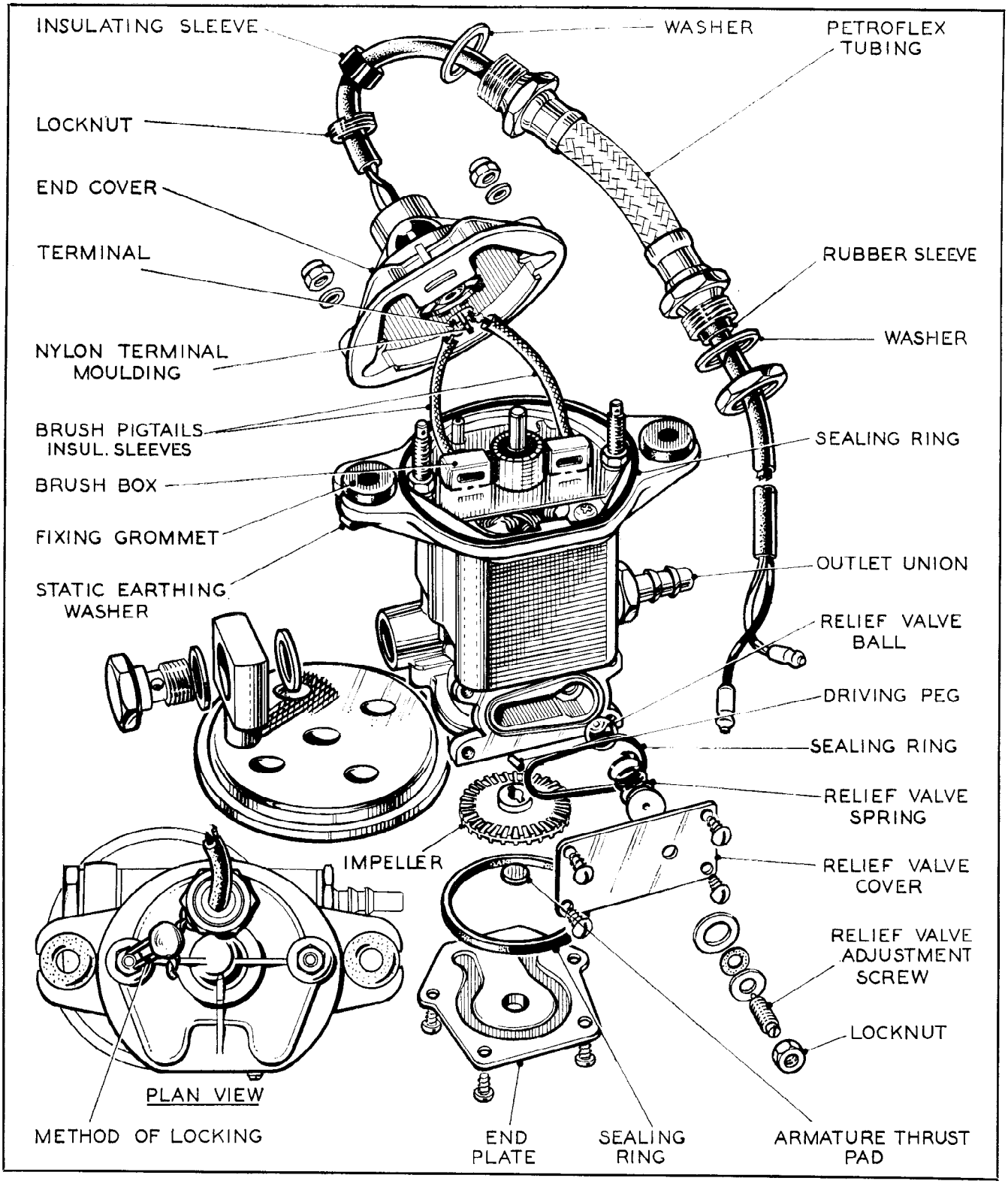

Fig. 2 Pump unit, dismantled

(*v*) In operation, the whole of the interior of the unit, including the commutator and brushgear of the motor, is flooded with fuel but, since there is no projecting shaft, no troubles associated with running seals can arise.

(*vi*) When the pump is running, fuel passes through the armature bearing at the pump end of the unit, into the motor chamber and thence through a return passage to the pump intake port. This continuous circulation obviates stagnation of fuel in the motor portion and serves also as a cooling medium for the winding.

(*vii*) In the event of a tank being allowed to become exhausted of fuel with a system having the unit mounted inside the tank, repriming of the pump is expedited by the provision of a small bleed hole in the pump body casting near the outlet port. A small continuous discharge occurs whilst the pump is running. Pumps mounted externally to the tank are required to be fitted so that the inlet port is always below the lowest fuel level and no bleed is necessary.

(*viii*) The unit, excluding armour-braided cable and filter, weighs $2\frac{1}{4}$ lb. (1.016 kg.).

(d) MOUNTING DETAILS

(*i*) The unit is mounted with the cable outlet uppermost. When the unit is located in the fuel tank, the intake filter is located as near to the bottom of the tank as possible without touching it. When located outside the tank, the filter and intake port are below the lowest fuel level, with a pipe run falling to the pump intake port. A 200-mesh inlet filter (200 holes per linear inch) of area and type to suit the individual application is fitted.

(*ii*) A typical method of internal tank mounting utilising two threaded rods is shown in Fig. 1. Alternatively, brackets of suitably stiff sheet or strip metal are used. The upper end of the mounting is secured to the underside of a gasket-sealed screw-secured cover plate.

(*iii*) At the lower end, sound-proofing is provided by rubber grommets in the pump mounting lugs.

(*iv*) The cover plate is provided on the outside with a normal fuel pipe union and connected on the inside, through high-grade petrol-proof plastic tubing, to the pump delivery port.

(e) ANTI-STATIC EARTHING WASHER — SPECIAL NOTICE

As previously mentioned, the pump is an insulated return unit. In automobile applications, the only metallic connection with the vehicle is through the anti-static earthing washer affixed to one of the rubber grommets in the mounting lugs. It is therefore essential to ensure that the claws of the washer are closed over the flange of the grommet, such that they become trapped between the grommet and the face of the member to which the unit is being bolted. Good electrical contact must be made with the latter.

2. MAINTENANCE

Model 2FP pump requires no periodic maintenance. When overhauling of the unit becomes necessary, removal of the pump and associated pipework should be carried out by Lucas, the installation manufacturer or his accredited agents.

3. PERFORMANCE DATA

(a) Performance at nominal voltage using petrol or paraffin (kerosene).

(*i*) Maximum fuel pressure with pump delivery blocked: 5.8 lb./in.^{2} (0.406 kg./cm.^{2}).

(*ii*) Maximum fuel flow with pump delivery unrestricted: 50 gal./hr. (227.25 l./hr.).

(*iii*) Fuel flow with relief valve set at 5 lb./in.^{2} (0.35 kg./cm.^{2}) and a delivery pressure of 3.5 lb./in.^{2} (0.245 kg./cm.^{2}): 26 gal./hr. (118.2 l./hr.).

(*iv*) Power taken at condition of 3(a) (*iii*): 19.6 watts.

(b) Performance at 112% nominal voltage with relief valve set for a maximum pressure of 5 lb./in.^{2} (0.35 kg./cm.^{2}) at nominal voltage.

(*i*) Maximum fuel pressure with pump delivery blocked: 5.25 lb./in.^{2} (0.368 kg./cm.^{2}).

(*ii*) Maximum fuel flow with pump delivery unrestricted: 56 gal./hr. (254.52 l./hr.).

(*iii*) Fuel flow at delivery pressure of 3.5 lb./in.^{2} (0.245 kg./cm.^{2}): 33 gal./hr. (149.99 l./hr.).

(*iv*) Power taken at condition of 3(b) (*iii*): 22.6 watts.

Note: The performance figures quoted above, and shown graphically in Fig. 3, are applicable when the fluid being pumped is petrol or paraffin (kerosene). Regardless of the fuel normally used, any pump can be bench tested using paraffin. Performance figures can, however, be provided for other fuels on receipt of the necessary data, i.e. application, name or type of fuel, its specific gravity, viscosity, operating conditions and temperature.

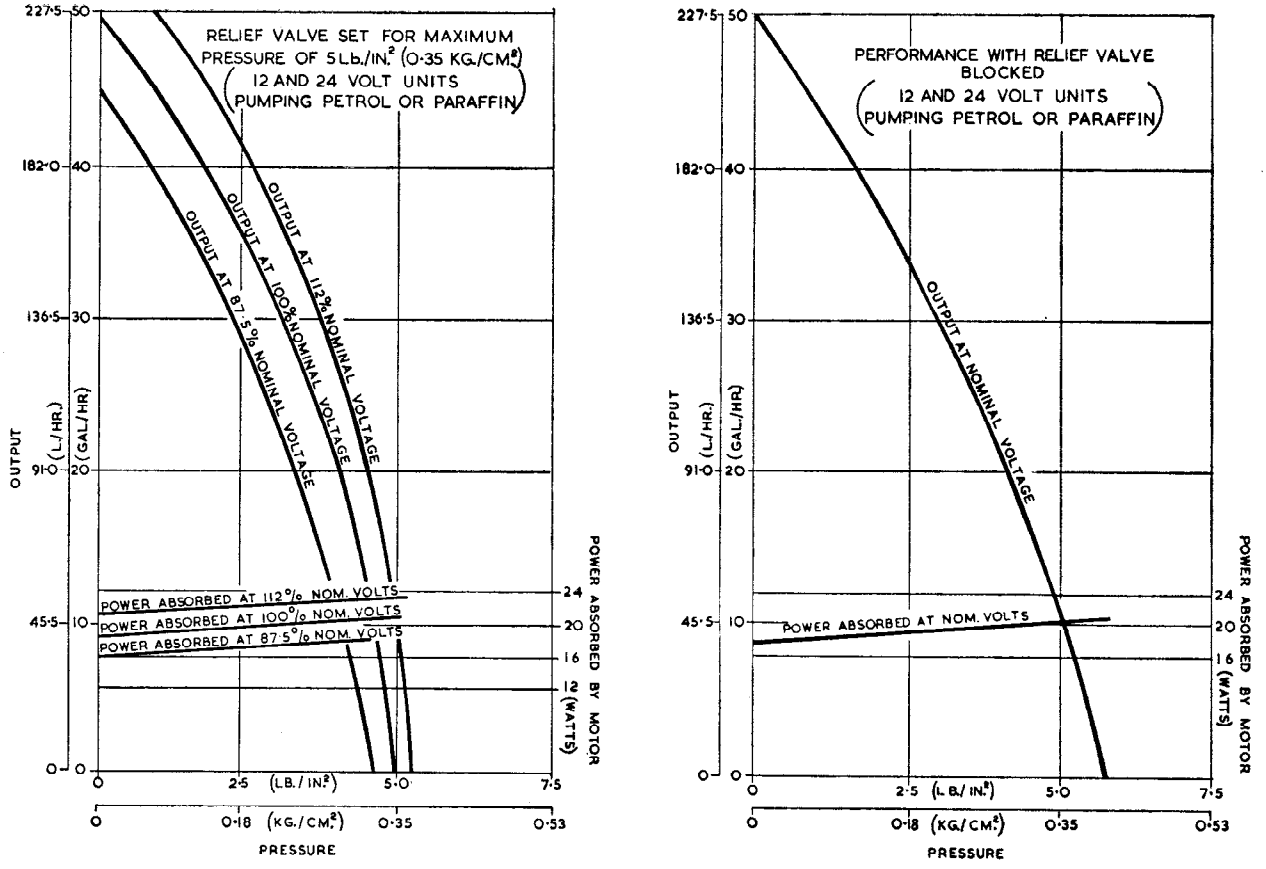

Fig. 3 Performance curves for petrol or paraffin (kerosene)

4. SERVICING

(a) PRELIMINARY INFORMATION

(*i*) All model 2FP fuel pumps, together with their ancillary equipment, are manufactured to the requirements of Ministry of Aviation specification EL1609 Issue 2, and are deemed flameproof when incorporated in approved installations. For this reason the motor end-cover and Petroflex armour-braided cable are sealed prior to leaving the Works and servicing of electrical portion is by unit replacement only.

Note: Overseas Agents who require to replace electrical parts are referred to Lucas World Service News No. 652.

(*ii*) Since, in automobile applications, ordinary ignition faults can present similar symptoms to those outlined in the fault diagnosis given below, it will be necessary to check the ignition circuit before proceeding.

WARNING: It is dangerous to make or break electrical connections in the vicinity of petrol fumes. Always ensure the battery is disconnected before removing or replacing electrical leads.

(b) FAULT LOCATION

Fuel Starvation

If, because of failure to run, uneven idling, misfiring or loss of power, it is suspected that a pump is failing to deliver the correct quantity of fuel, proceed as follows:

(*i*) Ensure that there is sufficient fuel in the tank.

(*ii*) Check the fuse in the pump circuit.

(*iii*) Disconnect the union of the delivery pipe near the carburetter and see if there is fuel delivery when the ignition is switched "On".

If fuel delivery appears normal, the pump is working satisfactorily and the fault should be looked for elsewhere.

If there is no fuel delivery, proceed as in para. 4 (b) (*iv*).

If fuel delivery appears low, or spasmodic, proceed as in para. 4 (b) (*v*).

(*iv*) If there is no fuel delivery, locate the snap-connector at which the pump is connected to the supply from the ignition switch. Measure the voltage and current at this point with the ignition switched "On". When working normally at the appropriate nominal voltage, the operating current will depend on the relief valve setting and delivery pressure. Excessive current consumption may indicate an internal fault necessitating a new unit. Approximate current values can be determined by reference to Fig. 3 and to the data on page 3.

If no current consumption is registered, refer to the wiring diagram and check the snap-connectors in the pump circuit on both the feed and return side of the pump. If these are in order, disconnect the pump feed wires from the snap-connector sleeves and reconnect them, via an ammeter to an external supply of appropriate voltage, noting that the BLACK feed wire must be connected to the POSITIVE supply terminal. Recheck the fuel delivery and the current consumption. If these are now normal, an open circuit in the wiring from the ignition switch or a faulty earth connection is indicated.

If there is still no delivery and no current consumption, a fault in the pump motor is indicated and a new unit should be fitted.

(*v*) If fuel delivery appears low, or spasmodic, this could indicate:

A damaged delivery pipe — check by inspection.
A partially blocked filter — this is an unlikely fault and requires removal of the pump from the tank for examination. Great care must be taken not to damage the gauze if it is necessary to clean the filter. See para. 4 (d).

A low relief valve setting — see para. 4 (e).

A fault in the pump, requiring a new unit to be fitted.

(c) FUEL FLOODING

In automobile applications, first check that the needle valve in the carburetter float chamber is clean and unworn. If satisfactory, check the delivery pressure by connecting a 0—6 lb./in.^{2} (0—0.42 kg./cm.^{2}) pressure gauge to the pump outlet. Operate the pump and measure the delivery pressure, which should be in accordance with the data given in para. 3.

If the delivery pressure is unsatisfactory, the pump must be removed from the tank in order that the pressure relief valve may be adjusted.

(d) CLEANING THE INLET FILTER

To clean the filter, submerge it in petrol or paraffin (kerosene) and gently swill until the obstruction is cleared.

Important: A brush or compressed air must never be used for this purpose.

(e) ADJUSTING THE RELIEF VALVE SETTING

A suitable rig for this purpose can be made by employing a container deep enough to receive the pump and containing sufficient paraffin (kerosene) to cover the inlet filter. Position the pump in the container on two small wooden packing blocks, which will ensure that the filter unit is clear of the bottom. Connect a 0—6 lb./in.^{2} (0—0.42 kg./cm.^{2}) gauge to the outlet union, and connect the pump to a supply of appropriate voltage (BLACK positive). Switch "On", and set the delivery pressure to 5 lb./in.^{2} (0.35 kg./cm.^{2}) by means of the adjusting screw on the pump cover plate, turning clockwise to increase, anti-clockwise to decrease. Secure the adjusting screw by means of the locknut.

(f) DISMANTLING THE PUMP UNIT

(*i*) Remove the inlet filter, if fitted.

(*ii*) Remove the five screws securing the pump end-plate to the body and lift off the plate, taking care not to lose the armature thrust pad, which is located in a well in the end-plate.

(*iii*) Remove the impeller and the drive peg from the armature shaft, taking care not to lose the sealing ring.

(*iv*) Remove the four screws securing the relief valve cover plate. The relief valve assembly may now be withdrawn.

(g) REASSEMBLING

Reassembly of the pump is the reversal of the dismantling procedure. The following points, however, should be carefully noted:

(*i*) If a new impeller is fitted the radial and side clearances must be checked. To check the radial clearance insert a feeler gauge between the impeller periphery and the pump body. The clearances should be 0.004—0.006 in. (0.1—0.15 mm.).

To check the side clearance, place a straight-edge across the bottom of the pump, with the sealing ring removed, and insert a feeler gauge between the impeller and the straight-edge. The total clearance should be 0.004—0.007 in. (0.1—0.18 mm.).

Note: The impeller should be fitted with the shouldered side towards the motor, so that the driving peg locates in the keyway.

(*ii*) If the sealing rings are damaged in any way, replacements must be fitted.

(*iii*) Check that the armature shaft thrust pad is in place before replacing the end-plate.