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LIQUID FUEL INJECTION SYSTEM FOR MULTICYLINDER INTERNAL COMBUSTION ENGINES
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Fig. 1

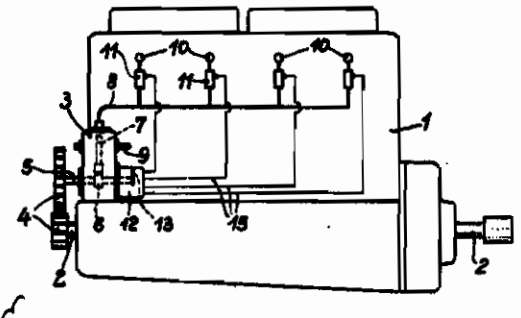


Fig. 2

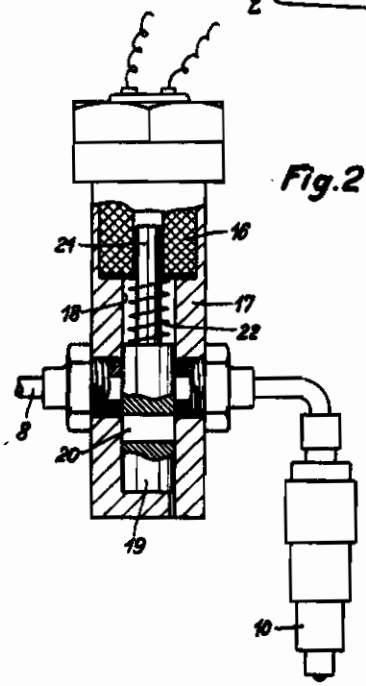


Fig. 4

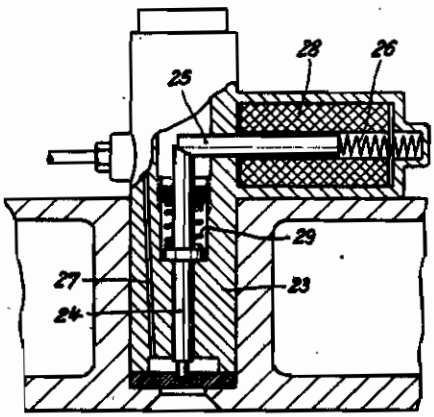
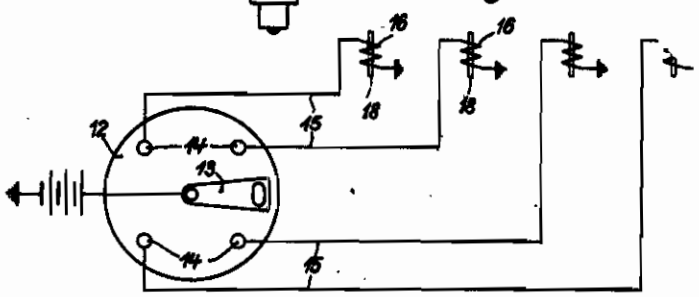


Fig. 3



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LIQUID FUEL INJECTION SYSTEM FOR MULTICYLINDER INTERNAL COMBUSTION ENGINES

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This invention relates to an injection system for multicylinder internal combustion engines in which the distribution of fuel is electromagnetically controlled.

In engines of this class an injection pump can be adjusted to deliver different amounts of fuel to a pressure piping common to a plurality of injection nozzles, and the fuel passes from this piping through one of the nozzles, successively electromagnetically controlled by a distributor, into the associated cylinder.

According to the invention, the distributor preselects a nozzle independently of the amount to be injected, and this nozzle is kept open by its associated magnet at least during the injecting period.

Two embodiments of the invention are illustrated in the accompanying drawing, in which

Figure 1 is a diagrammatic view of the total arrangement of an injection system according to the invention in an internal combustion engine;

Fig. 2 is a view of a slide valve arranged in the fuel supply piping;

Fig. 3 is a wiring diagram of the electrical members of the system; and

Fig. 4 is a view, partly in section, of an injection nozzle provided with locking means for the needle.

1 designates a four cylinder four stroke cycle internal combustion engine whose crankshaft 2 drives an injection pump 3 by means of a pair of gears 4 in such manner that the shaft 5 of the pump 3 rotates at half the speed of the crankshaft 2. A cam 6 disposed on the shaft 5 has four elevations, not shown, so that the piston 7, shown in broken lines, of the pump 3 carries out four delivery strokes at each rotation of the shaft 5. The amount of fuel supplied at each stroke to a pressure piping 8 communicating with the pump outlet is regulated in known manner by the displacement of a rod 9. The piping 8 has branches leading to various nozzles 10 disposed in the engine cylinders, and in each branch of the piping 8, in front of each nozzle 10, a shut-off member 11 is provided. Attached to the injection pump 3 is an electric distributor 12 whose revolving finger 13 is driven from the pump shaft 5 and passes over four contacts 14 at each revolution. From each of these contacts 14 an electric conductor 15 leads to one end of the winding of a field coil 16 provided in each shut-off member 11, the other end of the winding being earthed.

The shut-off member, clearly visible in Fig. 2, comprises a casing 17 made of magnetizable material and provided with a blind bore 18 in which a slide valve 19 is guided possessing a transverse bore 20. A spring 22 tends to force the slide 19, also made of magnetizable material, upon the bottom of the blind bore 18. An extension of the bore 18 accommodates the coil 16 whose core 21 is firmly united with the slide 19. When current flows through the coil 16, its core 21 is lifted and the slide 19 firmly connected thereto passes into a position at which its cross-bore 20 is on a level with a continuous transverse bore of the casing 17, with which the branch of the pressure piping 8 interrupted by the shut-off member is in communication, so that fuel can enter the nozzle 10 connecting with the end of this branch.

The circuit of each coil 16 controlled by the distributor 12 is closed at least during the injecting period so as to permit the flow of fuel to each nozzle 10.

Fig. 3 indicates the connections and the control of the coils for the shut-off members of the various nozzles 10. The quantity and the beginning of injection are determined, however, by the injection pump, so that the distributor 12 in establishing communication between a branch of the pressure piping 8 and a nozzle 10 through which fuel is to be injected merely performs a preselecting function.

Fig. 4 shows a shut-off member in connection with the nozzle. In the nozzle body 23 a needle 24 is guided, and a spring 29 tends to hold the needle 24 in its closed position shown. Over the upper end of the needle 24 a pin 25 guided in the nozzle body 23 is pushed vertically to the needle by a spring 26, and fuel entering at this position through a channel 27 in response to the pressure of the injection pump 3 is therefore unable to lift the needle 24. The other end of the pin 25 is placed in a field coil 28. When current flows through the coil 28, the pin 25 acting as magnet core is drawn into the coil against the action of the spring 26, and an impulse coming from the pump can now lift the needle 24. The control of the current impulses for the coils of each nozzle is effected also by the distributor 12.

In the examples shown only one coil is excited, namely that whose nozzle is selected for injection, and the coils of the other nozzles remain currentless. It is possible, however, to reverse conditions by utilizing the excitation of the coils for locking their associated nozzles and interrupting the exciting current only for the coil through whose nozzle an injection is to be made. In this case, the consumption of current would, however, be materially greater than in the construction shown.

WILLY VOIT.