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LIQUID FUEL SUPPLY SYSTEM FOR INTERNAL-COMBUSTION ENGINES

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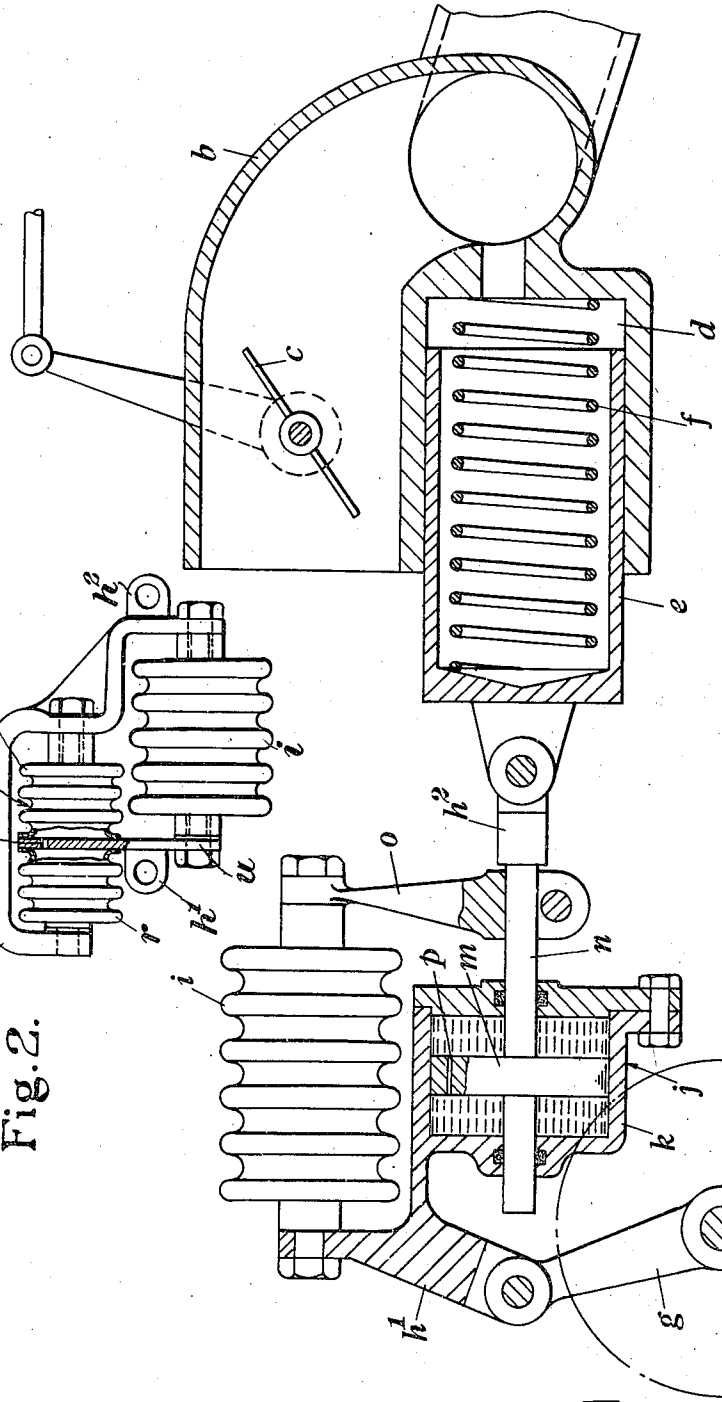


Fig. 1

Fig. 2.

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LIQUID FUEL SUPPLY SYSTEM FOR INTERNAL-COMBUSTION ENGINES

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This invention relates to liquid fuel supply systems for internal combustion engines, and particularly for road vehicle engines, of the type in which liquid fuel is injected by a pump whose output is variable in response to variations of pressure in the air-inflow passage. The object of the invention is to provide means whereby the pump output is also variable in response to variations of ambient atmospheric pressure and, if desired, also to ambient atmospheric temperature.

In the accompanying sheets of explanatory drawings:

Figure 1 is a part sectional side view showing one form of the invention embodied in a system for supplying liquid fuel to the engine of a road vehicle.

Figure 2 is a part sectional side view illustrating a modified form of the hydraulic coupling.

The liquid fuel supply system shown in Figure 1 includes a variable delivery injection pump *a* of any convenient type, and an air-inflow passage *b* which at or near its entrance is provided with a controlling valve *c* operable by the driver through a pedal or other means, and which forms part of the engine induction system. At a point between the valve *c* and the engine the passage *b* communicates with a cylinder *d* containing a piston *e*, the latter being loaded by a spring *f*, and being connected by a link (hereinafter described) to the output regulator *g* of the pump *a* so that the regulator is responsive to variations in the air pressure in the said passage, thus causing the quantity of liquid fuel supplied to the engine to be automatically varied in relation to the requirements of the engine.

In applying my present invention in the manner shown in Figure 1 to the system above described, I interrupt the link above mentioned and connect to its two ends h^1, h^2 a deformable capsule *i* which is responsive to variations of ambient atmospheric pressure, and which can consequently actuate the pump regulator independently of the piston *e*. The capsule *i* is, however, a relatively delicate device and is incapable of performing the duty of transmitting the normal pump-regulating movements of the piston *e*. I therefore interconnect the ends h^1, h^2 of the link by a hydraulic coupling *j* which is arranged in parallel with the capsule *i*. This coupling *j* may consist, as shown in Figure 1, of a cylinder *k* formed integrally with or attached to the end h^1 of the link, a piston *m* slidable in the cylinder, and a piston rod *n* extending through one end of the cylinder and attached to or formed integrally with the other end h^2 of the link, the piston rod having

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secured to it an arm *o* which interconnects the latter end of the link and the adjacent end of the capsule *i*. The cylinder *j* is filled with oil or other liquid, and a small leak *p* is arranged to enable the liquid to flow slowly from one side of the piston *m* to the other. All movements of the first mentioned piston *e* which is responsive to variations of pressure in the air-inflow passage *b* are transmitted to the pump regulator through the link ends h^1, h^2 and the hydraulic coupling *j* and the effective or over-all length of the link remains constant so long as no variations occur in ambient atmospheric pressure. But when the latter variations do occur they cause the length of the capsule *i* is to be increased or diminished. This change is accommodated by relative movement of the piston *m* and cylinder *k* of the hydraulic coupling, with the result that the effective or over-all length of the link is similarly varied and the pump regulator is correspondingly moved.

Instead of having the form shown in Figure 1, the hydraulic coupling *j* may have the form shown in Figure 2. Thus, it may consist of a pair of coaxially arranged deformable capsules *r*, *s* which at their outer ends are attached to opposite ends of a bridge piece *t* formed integrally with the link end h^2, and which at their adjacent ends are attached to opposite sides of a separating plate *u*, these capsules being filled with oil or other liquid, and a small leak *v* being provided to enable the liquid in the capsules to flow slowly from one side of the plate to the other. The plate *u* is formed integrally with the link end h^1, and the capsule *i* responsive to variations of ambient atmospheric pressure is attached at its opposite ends respectively to the plate and the link end h^2. The various parts of the example shown in Figure 2 function in essentially the same manner as the corresponding parts of the example shown in Figure 1.

In either of the examples above described, the capsule *i* is normally evacuated, but if desired a small amount of air or other gas may be allowed to remain in the capsule so that the latter is also responsive to atmospheric temperature.

By means of this invention the automatic adjustment of the pump output in response to air-inflow passage and ambient atmospheric pressure is effected in a very simple and satisfactory manner. The invention is not, however, restricted to the example described as subordinate constructional details may be modified to suit different requirements.

Having thus described my invention what I

claim as new and desire to secure by Letters Patent is:

1. A power transmission device comprising in combination a pair of transmission members one of which is movable by and relatively to the other, a deformable device interconnecting said members and responsive to ambient atmospheric pressure for imparting relative movement to said members, and a hydraulic coupling also interconnecting said members and arranged to transmit movement between said members independently of said deformable device whilst permitting relative movement of said members under the action of said deformable device.

2. A power transmission device comprising in combination a pair of transmission members one of which is movable by and relatively to the other, a deformable device interconnecting said members and responsive to ambient atmospheric pressure for imparting relative movement to said members, and a hydraulic coupling also interconnecting said members and arranged to transmit movement between said members whilst permitting relative movement thereof under the action of said deformable device, said hydraulic coupling comprising a relatively slidable piston and liquid-containing cylinder, and being provided with a small leak for enabling the liquid in said cylinder to flow slowly from one side of said piston to the other.

3. A power transmission device comprising in combination a pair of transmission members one of which is movable by and relatively to the other, a deformable device interconnecting said members and responsive to ambient atmospheric pressure for imparting relative movement to said members, and a hydraulic coupling also interconnecting said members and arranged to transmit movement between said members whilst permitting relative movement thereof under the action of said deformable device, said hydraulic coupling comprising a pair of coaxial liquid-containing capsules, and a separating plate to which the adjacent ends of said capsules are connected, said plate being provided with a small leak for enabling liquid to flow slowly from one side of said plate to the other.

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