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K. J. E. HESSELMAN

FUEL INJECTING DEVICE FOR INTERNAL COMBUSTION ENGINES

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Fig. 1.

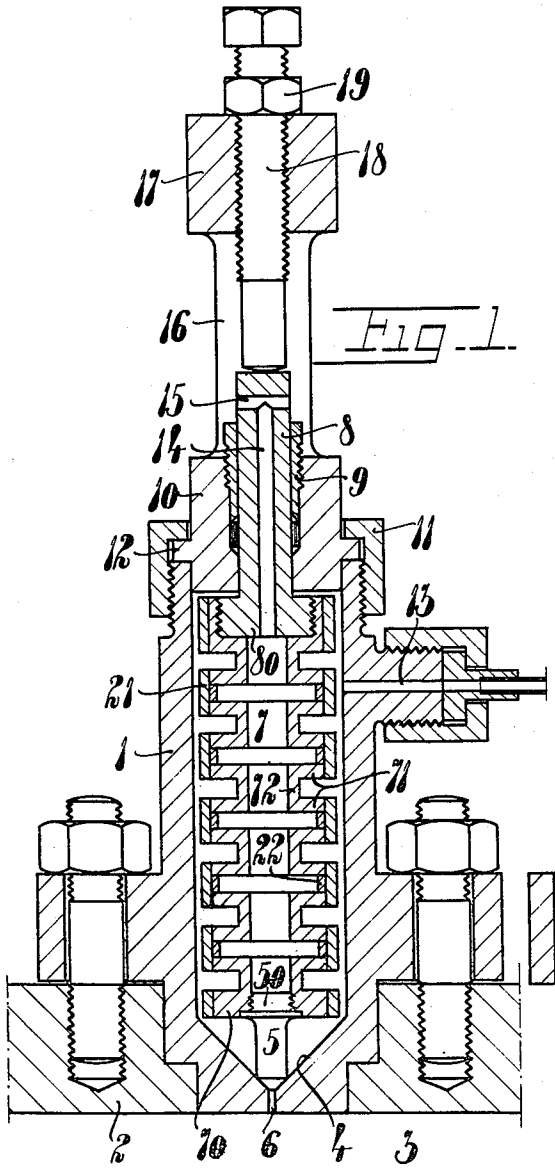
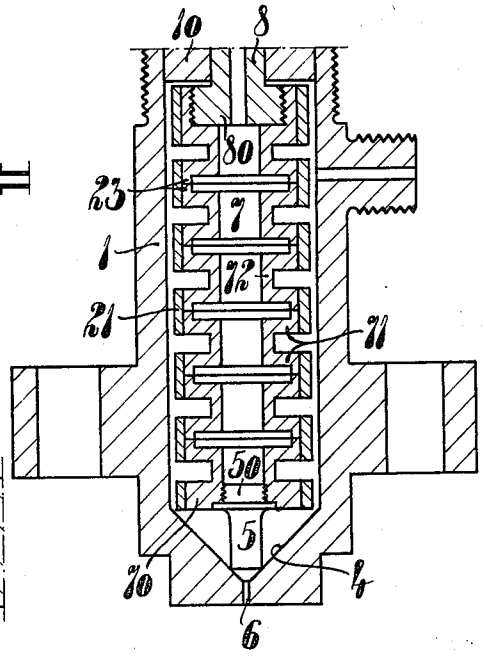


Fig. 2.



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FUEL-INJECTING DEVICE FOR INTERNAL-COMBUSTION ENGINES.

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To all whom it may concern:

Be it known that I, KNUT JONAS ELIAS HESSELMAN, a citizen of the Kingdom of Sweden, residing at Saltsjo-Storangen, Sweden, have invented new and useful Improvements in Fuel-Injecting Devices for Internal-Combustion Engines, of which the following is a specification.

In fuel injecting devices for internal combustion engines of the known kind in which the fuel is injected directly, leakage in the one way or the other is unavoidable. To overcome said difficulty it has already been proposed to control the opening movement of a fuel inlet valve by means of the fluid pressure through the intermedium of an elastic diaphragm. It has not been possible hitherto to obtain a reliable diaphragm for this purpose, capable of withstanding the very high pressure required in the fuel supplying conduit of a modern high pressure internal combustion engine.

The elasticity and the magnitude of the elastic power of an annular diaphragm depends on the thickness of the diaphragm, on the inner and outer diameters thereof, as well as on the degree to which the inner and outer circumference of the diaphragm are fixed. This degree is of essential importance, inasmuch as the flexibility of the diaphragm, when completely fixed will in most cases only correspond to a very small part of the flexibility of the diaphragm when freely supported. In fact, it is quite impossible to fix a diaphragm between a pair of flanges so that it may be considered to be completely fixed, or the degree of fixing may be determined. This is why diaphragms as hitherto proposed for fuel inlet valves have not been successful.

In the fuel inlet valve constructed according to this invention there is used a combination of a plurality of pairs of annular diaphragms in which the diaphragms of each pair are connected at their inner edges by means of cylindrical walls formed integral with said diaphragms while the diaphragms of adjacent pairs are connected together by separate rings embracing said diaphragms, spacing means being provided to hold the various pairs of diaphragms at proper distance apart.

In the accompanying drawing, Fig. 1 shows a longitudinal section through a fuel injecting device constructed in accordance with this invention.

Fig. 2 shows a longitudinal section of a somewhat modified embodiment of the flexible valve controlling member.

With reference to the drawing, the numeral 1 indicates the valve casing inserted in an opening in the wall 2 of the combustion chamber 3 of an internal combustion engine. The casing 1 is formed with an inner preferably conical seat 4 to be engaged by the needle valve 5 contained in said casing, and controlling the fuel injecting opening 6. The valve casing 1 further contains a flexible hollow member 7 carrying at its lower end the said needle valve 5. The said valve is formed with a head 50 having outer threads engaging corresponding threads of an opening formed in the bottom 70 of the member 7. At its upper end the flexible hollow member 7 carries a cylinder bolt 8 having a threaded head 80 engaging into a threaded opening at the top of the member 7. Said bolt 8 extends through a stuffing box 9 placed in the cover 10 of the valve casing 1. The said cover 10 is held in place by means of a flanged nut 11 threaded on the upper end of the casing 1 and bearing with its flange against a flange 12 formed on the periphery of the cover 10. The flexible hollow member 7 is built up of pairs of annular diaphragms 71, and the diaphragms of each pair are connected together at their inner edges by means of cylindrical walls 72 formed integral with said diaphragms 71. The diaphragms of adjacent pairs are connected together by means of separate shrunk rings 21 embracing said diaphragms and are held at proper distances apart by spacing rings 22 inserted between them.

The valve casing 1 is provided with a fuel inlet 13 leading into the valve chamber surrounding the flexible member 7 and the valve 5. The interior of the hollow flexible member 7 communicates with the atmosphere through channels 14, 15, extending through the bolt 8.

The cover 10 of the casing 1 carries by means of standards 16 (one of which only is shown, in the drawing) a cross piece 17. Engaging in a threaded opening in said cross piece 17 is a screw-bolt 18 bearing with its lower end on the top of the bolt 8 and carrying above the cross piece 17 a locking nut 19 bearing against the upper surface of said cross piece.

The flexible hollow member 7 owing to its construction will be compressed longitudi-

nally to a small extent when subjected to an external pressure sufficiently higher than the atmospheric pressure within the member 7.

As previously mentioned, the interior of the member 7 is constantly subjected to the atmospheric pressure, while the space surrounding the member 7 is subjected to the pressure of the fuel supplied through the inlet 13, said last-mentioned pressure depending on the action of a supply pump or the like.

When no pressure above atmospheric exists in the chamber surrounding the member 7, the needle valve 5 is held against its seat to close the opening 6 the member 7 acting as a spring. With increasing pressure in said chamber, due to the supply of fuel oil through the inlet 13, the member 7 will be compressed longitudinally so as to lift the valve 5 from its seat to permit the fuel to enter the cylinder. When the pressure in the said chamber decreases, the flexible member 7 will again take its normal length thereby pressing the needle valve against its seat.

By means of the screw-bolt 18, the flexible member 7 may be adjusted to open the valve for a more or less high pressure of the fuel.

To facilitate the construction of the flexible member 7, the latter may be formed in pieces manufactured independently and assembled to form a unitary structure.

The structure shown in Fig. 2 differs from that shown in Fig. 1 in that the spacing rings 22 shown in Fig. 1 are replaced by annular flanges 23 formed integral with the parts 71. As in the construction shown in Fig. 1 adjacent pairs of disks are connected together by shrunk rings 21.

Further modifications of the structure of the flexible member 7 may be made without deviating from the principle of the invention.

Having now described my invention I declare that what I claim is:—

1. In a device for injecting fuel under pressure in internal combustion engines, a casing having a chamber, a fuel inlet and a fuel outlet, an injection valve in said chamber comprising a needle valve to control said outlet, a flexible hollow member carrying said needle valve, said member being formed by a plurality of pairs of annular diaphragms the diaphragms of each pair being connected at their inner edges by means of cylindrical walls formed integral with said diaphragms, the diaphragms of adjacent pairs being connected by separate rings embracing them, spacing means being provided to hold said pairs at proper distances apart.

2. In a device for injecting fuel under pressure in internal combustion engines, a casing having a chamber, a fuel inlet and a fuel outlet, an injection valve in said chamber comprising a needle valve, a flexible hollow member carrying said needle valve, said member being formed by a plurality of pairs of annular diaphragms the diaphragms of each pair being connected at their inner edges by means of cylindrical walls formed integral with said diaphragms, the diaphragms of adjacent pairs being connected by separate shrunk rings embracing them, a spacing ring being provided between each two diaphragms connected by a shrunk ring.

In testimony whereof I have signed my name.

KNUT JONAS ELIAS HESSELMAN.