May 21, 1963 C. D. CORLEW 3,090,369

INTERNAL COMBUSTION MOTOR FUEL INJECTION SYSTEM

Filed Sept. 22, 1960

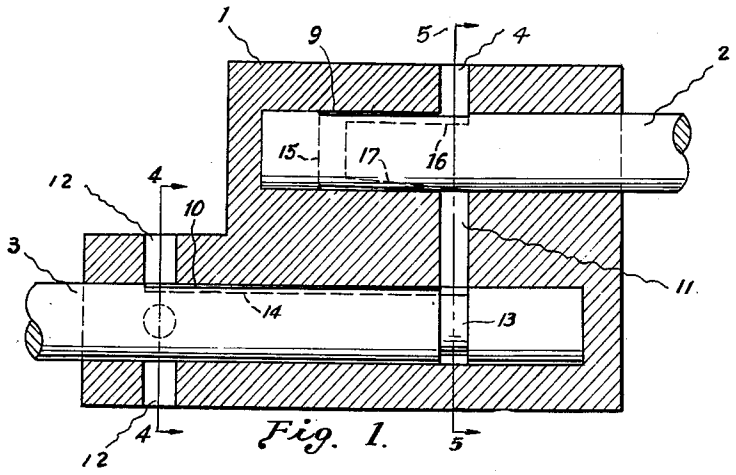

Fig. 1.

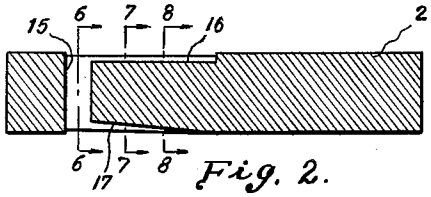

Fig. 2.

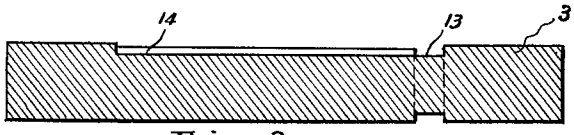

Fig. 3

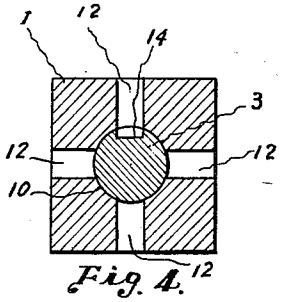

Fig. 4.

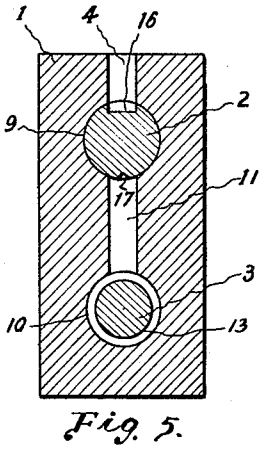

Fig. 5.

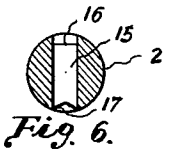

Fig. 6.

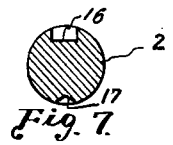

Fig. 7.

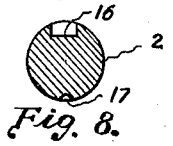

Fig. 8.

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INTERNAL COMBUSTION MOTOR FUEL INJECTION SYSTEM

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This invention relates to an internal combustion motor fuel injection system. It has for its main objects to provide such an injection system that will be highly satisfactory for the purpose intended, simple in structure, comparatively cheap to manufacture, easy to use and keep in working condition, and very durable.

Further objects are to provide such an injection system that will be adapted to use on any type of engine; increase low speed lugging ability, be little affected by wear, cause less wear in motor parts by incorporating a leaner fuel-air ratio, insure that each cylinder will get an equal fuel charge, provide economy of operation, and reduce air pollution.

Other objects and advantages will appear from the drawing and description, wherein:

FIG. 1 is an elevational view of an injection system made according to this invention, with the casing shown in section;

FIG. 2 is a longitudinal sectional elevation of the control member as disclosed in FIG. 1;

FIG. 3 is a longitudinal sectional elevation of the rotor shown in FIG. 1;

FIG. 4 is a section taken along the line 4—4 of FIG. 1;

FIG. 5 is a section taken along the line 5—5 of FIG. 1;

FIG. 6 is a section taken along the line 6—6 of FIG. 2;

FIG. 7 is a section taken along the line 7—7 of FIG. 2; and

FIG. 8 is a section taken along the line 8—8 of FIG. 2.

Similar reference numerals refer to similar parts throughout the several views.

Referring now to the drawings in more detail, the fuel injection assembly comprises a casing or housing **1** made of a single block of metal or other suitable material. A pair of spaced elongated chambers **9** and **10** are formed in the casing **1** and connected by a communicating fuel passage **11**. Each chamber **9** and **10** has a closed end and an open end. The chamber **9** is adapted to slidably receive an elongated control member **2**, and the chamber **10** is adapted to rotatably receive an elongated rotor **3**. The casing **1** is provided with a fuel inlet **4** communicating with the fuel control chamber **9** on the opposite side of the control member **2** from the fuel passage **11**. Longitudinally spaced from the fuel passage **11** toward the open end of the chamber **10** are a plurality of radial fuel discharge ports **12** annularly spaced around the chamber **10**. The rotor **3** is provided with an annular recess **13** in transverse alignment with the fuel passage **11**, and an elongated groove **14** communicating at one end with the annular recess **13**, and terminating at the opposite end at a point to permit selective communication of the groove **14** with the ports **12** as the rotor **3** is rotated within the chamber **10**.

The control member **2** is provided with a transverse fuel control passage **15**. An elongated channel-shaped recess **16** of substantially uniform cross-section is formed in the top of the control member **2** and is adapted to communicate the fuel inlet **4** with the transverse fuel passage **15** for any normal longitudinal operational position of the control member **2** within the control chamber **9**. On the other hand, a substantially V-shaped recess **17** is formed in the bottom portion of the control member **2**, and is longitudinally tapered from the transverse fuel passage **15** outwardly toward the fuel passage **11**.

The tapered recess **17** is adapted to form a very fine aperture communicating with the fuel passage **11** when the control member **2** has been moved to its extreme left position, as illustrated in FIG. 1, which is the idling position. As the control member **2** is gradually moved toward the right, a larger opening is formed between the tapered recess **17** and the fuel passage **11** in order to gradually permit more fuel to be introduced into the recess **14** and consequently discharge through the ports **12**. When the control member **2** is moved to a position where the transverse control passage **15** is in substantial alignment with the fuel inlet **4** and the fuel passage **11**, the injection assembly is at full throttle position.

In the preferred form of use of the injection assembly, the fuel inlet **4** is connected in the fuel line of a conventional internal combustion motor or engine to a constant source of fuel pressure. Each discharge port **12** is connected through a separate fuel line to the cylinder of the engine, and preferably to a cylinder including a differential type or other suitable nozzle, not shown. The rotor **3** is driven in timed relation with the engine in order that the fuel will be distributed to the proper cylinder at the proper time. Any appropriate means may be employed for manually controlling the longitudinal movement of the control member **2** within the chamber **9** in order to control the size of the opening formed by the tapered recess **17** and consequently the amount of fuel which will flow through the passage **11**.

With the fuel control member **2** in its extreme left position, as disclosed in FIG. 1, with the engine running and the rotor **3** rotating, fuel at a pre-determined pressure will flow through the inlet **4**, channel-shaped recess **16**, the transverse passage **15**, the tapered recess **17**, through the restricted opening between the recess **17** and the passage **11**, through the passage **11**, the annular recess **13** and the elongated groove **14**. As the rotor **3** rotates to open communication between the recess **14** and one of the ports **12**, fluid will commence to flow from the recess **14** through the corresponding port **12** and into the corresponding cylinder. However, because of the restricted flow through the tapered recess **17**, the pressure of the fluid from that point forward to the corresponding engine valve will drop sufficiently to close the corresponding fuel nozzle, not shown. Continued rotation of the rotor **3** will close the corresponding discharge port **12**. With the discharge port **12** closed, the pressure of the fluid in the recess **14** and the passage **11** will build up again to the pressure at the inlet **4**, until the next successive port **12** is open, and the cycle is repeated. Thus, as the control member **2** is moved to the right to various positions, the tapered recess **17** will proportionately open the fuel passage **11** to gradually increase the pressure beyond this point so that the nozzle will be held open for progressively longer periods of time in order to proportionately increase the quantities of fuel injected into each engine cylinder.

From the foregoing it appears that an injection system like the present will have no plungers for each cylinder, yet will have means to accurately control the fuel injected and other advantages heretofore mentioned.

The various parts of the system may be made of any material suitable for the purpose; I prefer good grades of metal. Also, the parts may be made of different sizes and capacities, depending upon the size of motors on which they are to be used.

While I have shown and described the preferred embodiment of my invention, I do not wish to limit same to the precise and exact details of the structure and reserve the right to make all modifications and changes so long as they remain within the scope of the invention and the following claims.

Having described my invention I claim:

1. An internal combustion motor fuel injection system, comprising:

(*a*) an elongated fuel control member,

(*b*) means for longitudinally and slidably receiving said control member,

(*c*) an elongated rotor,

(*d*) means for rotatably receiving said rotor,

(*e*) annularly spaced fuel discharge ports in said rotor receiving means,

(*f*) a fuel inlet communicating with said control member receiving means,

(*g*) a fuel passage communicating said control member receiving means with said rotor receiving means, said fuel passage being longitudinally spaced from said discharge ports and substantially opposite said fuel inlet,

(*h*) an elongated groove in said rotor extending from said fuel passage to the annular plane of said discharge ports for progressive communication with said ports as said rotor rotates,

(*i*) a transverse fuel control passage through said control member,

(*j*) an elongated channel-shaped recess in said control member for communicating said transverse passage with said fuel inlet for various longitudinal positions of said control member,

(*k*) a longitudinal tapered recess formed on said control member tapering from said transverse recess outwardly of said control member for communicating said transverse passage with said fuel passage so that the passage of fuel therethrough varies with the longitudinal position of said control member.

2. The invention according to claim 1 in which said control member receiving means comprises a chamber having an open end for slidably receiving said control member, and said tapered recess forms a tapering passage with the adjacent wall of said chamber.

3. The invention according to claim 1 in which said channel-shaped recess comprises a substantially uniform cross section.

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