Dec. 8, 1931. H. D. HILL 1,835,047

FILTER FOR FUEL INJECTION LINES OF INTERNAL COMBUSTION ENGINES

Filed Sept. 30, 1929

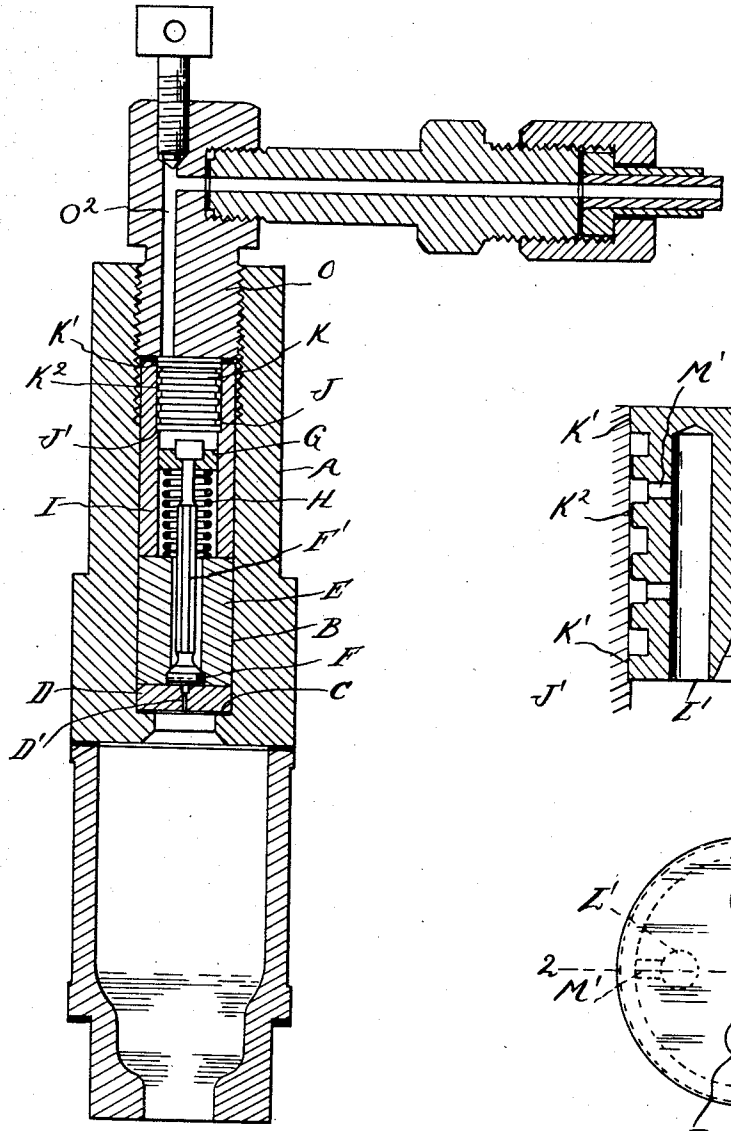


Fig. 1.

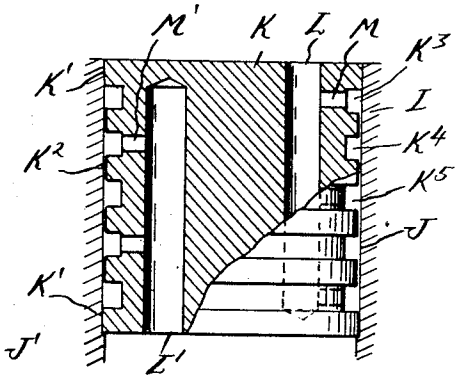
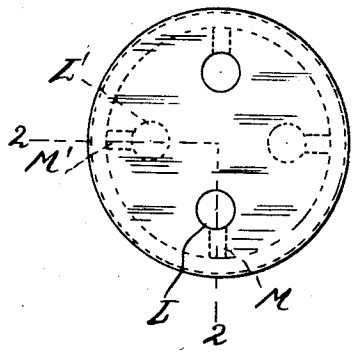


Fig. 2.

Fig. 3.



INVENTOR
Harry D. Hill
BY Whittemore Hulbert
Whittemore & Belknap
ATTORNEYS

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UNITED STATES PATENT OFFICE

HARRY D. HILL, OF LANSING, MICHIGAN, ASSIGNOR TO HILL DIESEL ENGINE COMPANY, OF LANSING, MICHIGAN, A CORPORATION OF MICHIGAN

FILTER FOR FUEL INJECTION LINES OF INTERNAL COMBUSTION ENGINES

Application filed September 30, 1929. Serial No. 396,341.

The invention relates to internal combustion engines of the Diesel type and more particularly to the construction of filter arranged in the fuel line between the injection pump and the injection nozzle. In such engines the fuel when injected into the combustion chamber is sprayed to facilitate the thorough commingling of the same with the air which supports combustion, and to this end a sprayer nozzle is provided having a restricted aperture through which the fuel must pass. It is therefore highly important that the fuel reaching this nozzle should be freed from all suspended impurities, as a very small particle of solid matter would be sufficient to clog the nozzle and render the same inoperative. It is the object of the present invention to obtain a construction of filter which may be placed in the fuel line between the pump and nozzle and which without interfering with the free flow of fuel will effectually eliminate any suspended impurities. To this end the invention consists in the construction as hereinafter set forth.

In the drawings:

Figure 1 is a central longitudinal section through a fuel nozzle and a portion of the fuel line leading thereto and containing my improved filter;

Figure 2 is an enlarged sectional elevation through the filter line 2—2 of Figure 3;

Figure 3 is a plan view of Figure 2.

As illustrated, A is the casing of the fuel injection nozzle adapted to be secured in the engine casing (not shown). This casing A has a longitudinal bore B therethrough provided with a counterbore which forms a shoulder C constituting a seat for a disk D. The latter is provided with a fine aperture D′ which constitutes the jet opening. Adjacent to the disk D is a block E forming the seat for a valve F. This valve has a stem F′ extending through the block E and provided at its end with a collar G which engages a spring H abutting against the block and forming means for normally holding the valve seated.

Adjacent to the block E is a bushing I, a portion of which surrounds the stem F′, collar G and spring H. Beyond this portion the bushing is counterbored as indicated at J to form a shoulder J′ and to receive a filter block which is constructed as follows:

K is a block of a diameter to fit within the portion J of the bushing I, said block being provided with a series of annular grooves in the periphery thereof. The end portions K′ of the block are of a diameter to closely fit within the portion J of the bushing but the portions K^2 intermediate the grooves are slightly less in diameter preferably only to the extent of one-thousandth of an inch. This will leave a space between these portions and the wall of the bushing which is approximately one-half of one-thousandth of an inch in width. The block K is further provided with longitudinal bores which extend only partway through the block and enter alternately from opposite ends thereof. As shown the bores L on diametrically opposite sides of the axis of the block extend inward from one end and the bores L′ which are in a plane at right angles to that of the bores L extend into the block from the opposite end. The annular grooves are connected alternately to the bores L and L′ by ports M and M′ drilled laterally from the bottom of the groove into the bore. Thus as shown the upper groove K^3 is connected by the ports M to the bores L. The second groove K^4 is connected by the ports M′ with the bore L′. The third groove K^5 is connected by ports M to the bores L and so on throughout the series.

The block K when placed in the portion J of the bushing I is held therein by a fitting O which has a screw threaded engagement with the outer end of the casing A and which forms the inlet for the fuel from the injection pump (not shown). Between the fitting O and the bushing J is an annular gasket which seals the joint preventing leakage of the fuel around the bushing.

In operation, the parts being assembled as shown in Figure 1, the fuel which is admitted through the passage O^2 in the fitting O enters the bores L and through the ports M passes into the grooves K^3, K^5, etc. As the bores L do not extend completely through the block the only further passage for the

fuel is by way of the intermediate grooves K^4, ports M' and bores L'. However, to travel by this route the fuel must pass through the very restricted clearance between the portions K^2 and the wall of the bushing and as this is approximately one-half of one-thousandth of an inch, it will prevent any particle of greater diameter from passing through. Thus any particle which finds its way to the jet aperture D' will be too small to plug this aperture. At the same time the length around the periphery of the block K multiplied by the number of grooves will give a total area for the passage of the fuel such as to not impede its progress.

The construction as above described is one which can be cheaply manufactured and which will not change in use. All that is necessary to maintain the filter in operative condition is to occasionally remove the block from the housing and clean off any sediment that may have accumulated.

What I claim as my invention is:

1. The combination with a fuel line for an internal combustion engine, of a filter therefor comprising a casing, a block within said casing provided with a series of peripheral grooves and portions intermediate said grooves having a slight clearance in relation to the wall of the casing, offset inlet and outlet passages extending longitudinally partway through the block from opposite ends thereof and ports for connecting said grooves alternately with the passages from opposite ends of the block for the purpose described.

2. The combination with a fuel line for internal combustion engines, of a filter therefor comprising a casing having a cylindrical recess therein, a cylindrical block having its opposite end portions closely fitted within said cylindrical recess, a series of annular grooves between the end portions of said block, portions intermediate said grooves having a restricted clearance in relation to the wall of the casing offset inlet and outlet passages extending partway through said block from opposite ends thereof and ports connecting said grooves alternately with said passages from the opposite end of the block for the purpose described.

3. The combination with a fuel injection nozzle for internal combustion engines provided with a fine jet aperture, of a filter within the nozzle casing comprising a cylindrical block having portions closely fitting the walls of a cylindrical recess within said nozzle casing, a series of annular peripheral grooves in said block intermediate said portions and portions intermediate said grooves of a diameter slightly less than the diameter of said first-named portions, said block having offset inlet and outlet passages extending longitudinally partway through the same from its opposite ends and ports for connecting said grooves alternately with said passages.

4. The combination with a fuel line for an internal combustion engine, of a filter therefor comprising a casing, a block in said casing provided with a series of circumferentially extending grooves and portions intermediate said grooves having a slight clearance in relation to the wall of the casing, said block having offset inlet and outlet passages extending longitudinally partway through the same from the opposite ends thereof, said blocks also having ports for establishing communication between alternate grooves and said inlet passage, and additional ports for establishing communication between the remaining grooves and said outlet passage.

5. In an internal combustion engine, the combination with a casing forming a fuel injection nozzle, of a disk within said casing provided with a fine aperture forming the fuel jet, a block adjacent to said disk forming a valve seat, a valve for engaging said seat, a stem for said valve extending through an aperture in said block and beyond the same, a collar on said stem, a spring between said collar and said block, a bushing within said casing surrounding said stem and collar and abutting against said block, a cylindrical recess in said bushing beyond said stem and collar, a block having portions closely fitting said cylindrical recess with a plurality of peripheral grooves intermediate said fitting portions and one or more portions intermediate said grooves, of a diameter slightly less than that of said fitting portions to provide a restricted clearance between the same and the walls of the recess, passages extending longitudinally partway through said block from opposite ends thereof, ports connecting the alternate grooves with the passages from opposite ends of the block and a fitting engaging said casing for holding the members therein in assembled relation and providing an inlet for the fuel whereby all of the fuel leaving the jet aperture must pass around the periphery of the portions intermediate said grooves and through the restricted clearance between the same and the wall of the recess.

In testimony whereof I affix my signature.

HARRY D. HILL.