Aug. 9, 1960 R. J. WIRSCHING 2,948,159

INJECTION PUMP FOR INTERNAL COMBUSTION ENGINE

Filed March 25, 1957

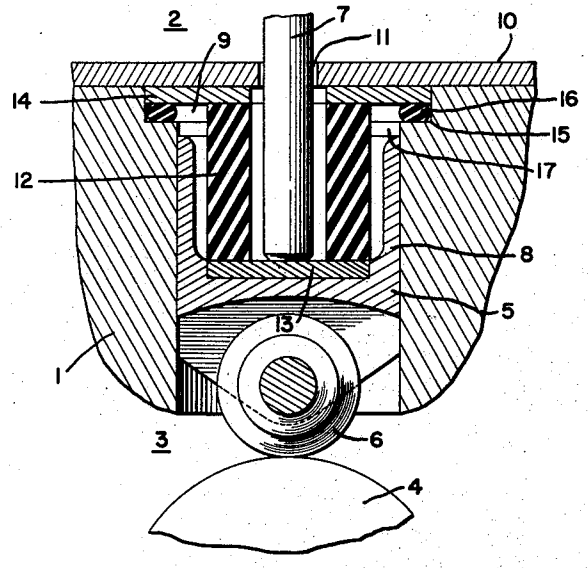


FIG. 1.

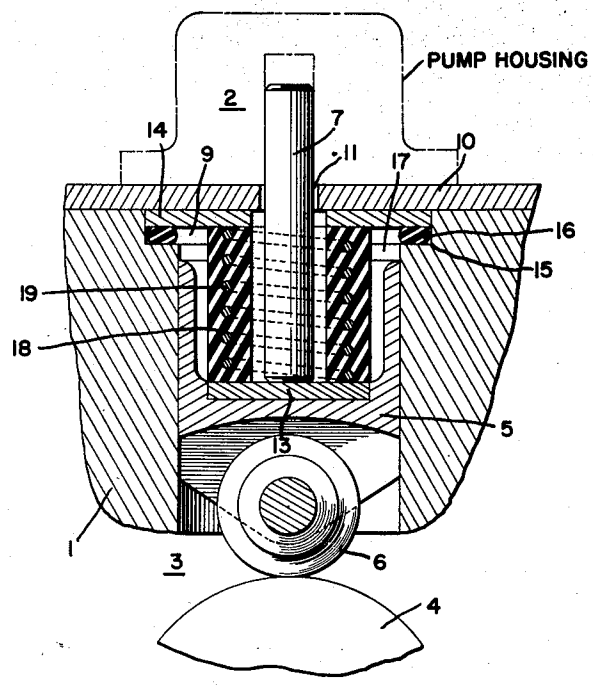


FIG. 2.

INVENTOR
ROBERT J. WIRSCHING

BY Dicke and Craig

ATTORNEYS

United States Patent Office 2,948,159 Patented Aug. 9, 1960

2,948,159

INJECTION PUMP FOR INTERNAL COMBUSTION ENGINE

Robert J. Wirsching, Korntal, near Stuttgart, Germany, assignor to Daimler-Benz Aktiengesellschaft, Stuttgart-Unterturkheim, Germany

Filed Mar. 25, 1957, Ser. No. 648,008

Claims priority, application Germany Apr. 4, 1956

10 Claims. (Cl. 74—55)

The present invention relates to a fuel injection pump for internal combustion engine, and more particularly to a connection between the cam shaft and pump piston which is established by a tappet constructed as a sliding member providing for the transmission of forces from the cam shaft to the pump piston.

In prior art construction, it was often disadvantageous that the pump side could not be adequately sealed against the cam shaft space. Even if separating walls were provided between the pump piston space and the cam shaft space, apertures nevertheless had to be provided for the passage of the pump pistons or the tappets disposed at the ends of the pump pistons which rendered difficult an adequate sealing of both the spaces.

The present invention aims at obviating this disadvantage and consists essentially in that the tappet is provided with a rubber spring which is preferably cylindrical and surrounds the lower end of the pump piston and which produces a complete sealing of the pump side with respect to the cam shaft space.

In an internal combustion engine provided with a separating wall between the pump side and the cam shaft space, in which the tappet is slidingly guided in the separating wall, the tappet according to a further feature of the present invention may be provided with a cylindrical wall and a bottom closing the inner space of the tappet toward the cam shaft. A spring is thereby arranged in the interior of the tappet which spring is formed as a cylindrical ring and which consists of elastic material. This spring abuts, on the one hand, against the bottom of the tappet, and, on the other, against a plate by means of which the aperture in the separating wall in which the tappet slides is covered.

It is also advantageous if the cylindrical rubber spring be provided in the inside thereof with a helical or coil spring which may be vulcanized into the rubber spring.

Accordingly, it is an object of the present invention to provide an arrangement which enables a complete seal between the pump side of a fuel injection pump and the cam shaft space, and more particularly to do so by simple means.

It is another object of the present invention to provide a tappet which is suitably guided in the separating wall and at the same time accommodates a spring to assure continuous engagement between the pump piston and cam shaft so that the former accurately follows the contour of the latter while simultaneously therewith establishing an effective seal between the pump and cam shaft spaces.

A still further object of the present invention is to provide a simple construction which may be readily assembled and which is relatively inexpensive and yet provides a complete adequate seal between the fuel injection pump and the space in which the cam shaft actuating the injection pump is disposed.

These and further objects, features, and advantages in accordance with the present invention will become more obvious from the following description when taken in connection with the accompanying drawing, which shows, for purposes of illustration only, two embodiments in accordance with the present invention and wherein:

Figure 1 is a longitudinal cross-sectional view through the pump plunger or tappet of a fuel injection pump provided with a rubber spring, and

Figure 2 is a longitudinal cross-sectional view through a modified embodiment similar to that of Figure 1 and provided with a plunger in which a coil spring is vulcanized into the inside of the rubber spring.

Referring now to the drawing wherein like reference numerals designate like parts through the various views and more particularly to Figure 1, reference numeral 1 designates the separating wall which separates the pump space 2 from the cam shaft space 3 disposed therebelow. Only a portion of the cam shaft is shown which may be of suitable construction and is designated by reference numeral 4. The roller 6 abuts or follows the contour of the cam 4, the roller 6 being rotatably journalled in any suitable manner at the lower part of the tappet 5.

The tappet 5 establishes the connection transmitting the forces between the cam 4 and the pump piston 7. The longitudinal cross section through the tappet 5 of Figure 1 shows that the walls 8 thereof are formed cylindrically. The outer surface of the lateral limiting walls 8 thereby serves for the guidance of the tappet 5 in the separating wall 1 during the upward and downward movements of the tappet 5.

The aperture 9 of the separating wall in which the tappet 5 slides is covered by a plate 10. Only a smaller aperture 11 is provided in this plate 10 which has a diameter slightly larger than the diameter of the pump piston 7.

The rubber spring 12 in accordance with the present invention abuts or supports itself, on the one hand, against the bottom on the inside of tappet 5 and, on the other, against the bottom or lower side of the plate 10, and more particularly in such a manner that at the places of abutment a sealing connection is provided. By reason of the elasticity of the material from which the rubber spring 12 is made, the rubber spring 12 is simultaneously capable of exerting a continuous downward pressure or force on the tappet 5 so that the tappet 5 remains in continuous contact with the surface of the cam 4.

In order to further assure a safe sealing, a plate 13 may be provided with rests against the bottom of the tappet 5 and a plate 14 may be provided below the cover plate 10. Appropriately, these plates 13 and 14 are vulcanized to the rubber spring 12.

In the embodiment illustrated in Figure 1, the plate 14 is futher sealed on the outside thereof by means of an annular sealing ring 16 which is fitted into groove 15.

The upper edge 17 of the tappet 5 terminates at such a distance from the lower side of the plate 14 that sufficient space remains for the tappet 5 in the upward movement thereof. In order to provide further safety, the pump piston 7 may be surrounded at the place 11 of its passage through the plate 10 with a gland or the like of suitable construction.

Figure 2 shows an arrangement essentially similar to Figure 1 in which the various parts are also shown in longitudinal cross section. In this embodiment, the pump tappet 5 is also springingly and sealingly supported. This embodiment differs from that of Figure 1 only in that the rubber spring 18 thereof according to the present invention is modified. More particularly, for purposes of increasing the rigidity and the pressure effect, a coil spring 19 is vulcanized into the rubber spring 18. Otherwise, Figure 2 is similar to the embodiment of Figure 1.

It is also understood that the cylindrical spring 12 or

18 may also be made of any suitable elastic material other than rubber.

While I have shown and described two embodiments in accordance with the present invention, it is understood that the same is not limited thereto but is susceptible of various changes and modifications within the scope of the present invention, and I intend to cover all such changes and modifications as are encompassed by the appended claims.

I claim:

1. A force-transmitting connection between a fuel injection pump for an internal combustion engine provided with a piston and a pump-actuating cam driven by a cam shaft comprising means between said cam shaft and pump piston including a tappet for transmitting the forces from said cam to said pump piston, and a cylindrical rubber spring within said tappet surrounding the lower end of said pump piston to thereby provide a complete sealing of the pump side from the cam shaft space.

2. A force-transmitting connection according to claim 1, further comprising two plates, one plate each being connected to one respective end of said cylindrical rubber spring.

3. A force-transmitting connection according to claim 2, wherein said plates are vulcanized to said spring.

4. A force-transmitting connection according to claim 1, wherein said cylindrical rubber spring includes a coil spring vulcanized into said cylindrical rubber spring.

5. A force-transmitting connection between a fuel-injection pump for an internal combustion engine provided with a piston and a pump-actuating cam driven by a cam shaft comprising a separating wall between the cam shaft space and the pump side, a tappet transmitting the forces from said cam to said pump piston, said separating wall being provided with an aperture for slidingly receiving therein said tappet, and a cylindrical spring made of elastic material and surrounding the lower end of said pump piston to thereby provide a complete sealing of said pump side from said cam shaft space while simultaneously urging said tappet into engagement with said cam.

6. A force-transmitting connection according to claim 5, further comprising a covering plate for said aperture between said pump and said separating wall and provided

with a further aperture for the passage therethrough of said pump piston, said cylindrical spring abutting, on the one hand, against said covering plate and, on the other, against said tappet.

7. A force-transmitting connection according to claim 6, further comprising a plate for each end of said cylindrical spring, said plates being vulcanized to said spring.

8. A force-transmitting connection according to claim 5, further comprising a helical wire spring vulcanized into said cylindrical spring.

9. A force-transmitting connection between a fuel-injection pump for an internal combustion engine provided with a pump piston and a pump-actuating cam driven by a cam shaft comprising a separating wall provided with an aperture between the cam shaft space and the pump side, a tappet formed as sliding member and transmitting the forces from said cam to said pump piston, said tappet being formed by cylindrical walls and a bottom closing said cylindrical walls in the direction of said cam, a cover plate to cover said aperture, and a cylindrical rubber spring surrounding the lower end of said pump piston to thereby provide a complete sealing of the pump side from the cam shaft space, said cylindrical rubber spring abutting against the undersurface of said cover plate and the upper side of said tappet bottom.

10. A fuel-injection pump for an internal combustion engine provided with a cam driven by a cam shaft and pump piston comprising a connection between said cam and said pump piston including a tappet formed as sliding member and transmitting the forces from said cam to said pump piston, said tappet being provided with a cylindrical rubber spring surrounding the lower end of said pump piston to thereby provide a complete sealing of the pump side from the cam shaft space while simultaneously urging said tappet into engagement with said cam.

References Cited in the file of this patent

UNITED STATES PATENTS

1,695,848	Higgins	Dec. 18, 1928
2,038,968	Summers	Apr. 28, 1936
2,398,798	Meyers	Apr. 23, 1946
2,532,000	West	Nov. 28, 1950
2,605,099	Brown	July 29, 1952
2,755,671	Delaney	July 24, 1956