April 17, 1956 R. L. GRAY ET AL 2,742,050

FUEL DISTRIBUTOR FOR DIESEL ENGINES

Filed Aug. 18, 1952 3 Sheets-Sheet 1

Fig. 1

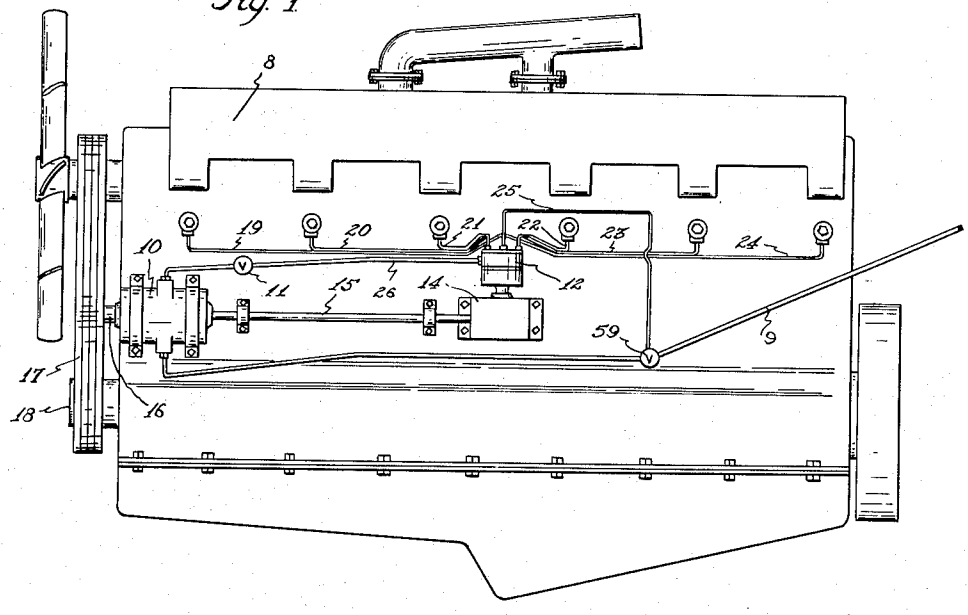



Fig. 3.

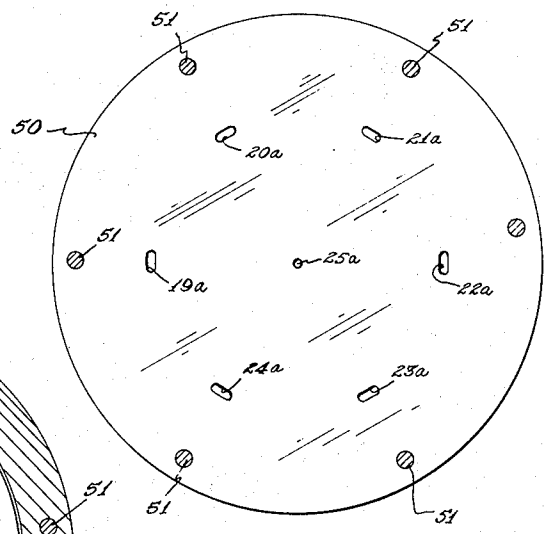
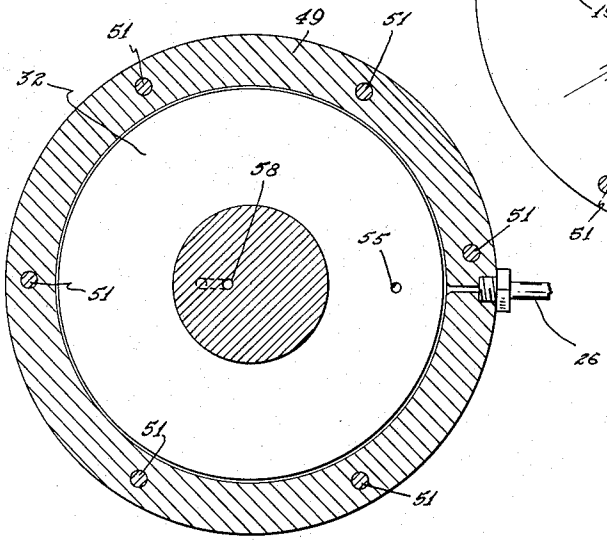



Fig. 4




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April 17, 1956 R. L. GRAY ET AL 2,742,050

FUEL DISTRIBUTOR FOR DIESEL ENGINES

Filed Aug. 18, 1952 3 Sheets-Sheet 2

Fig. 2.

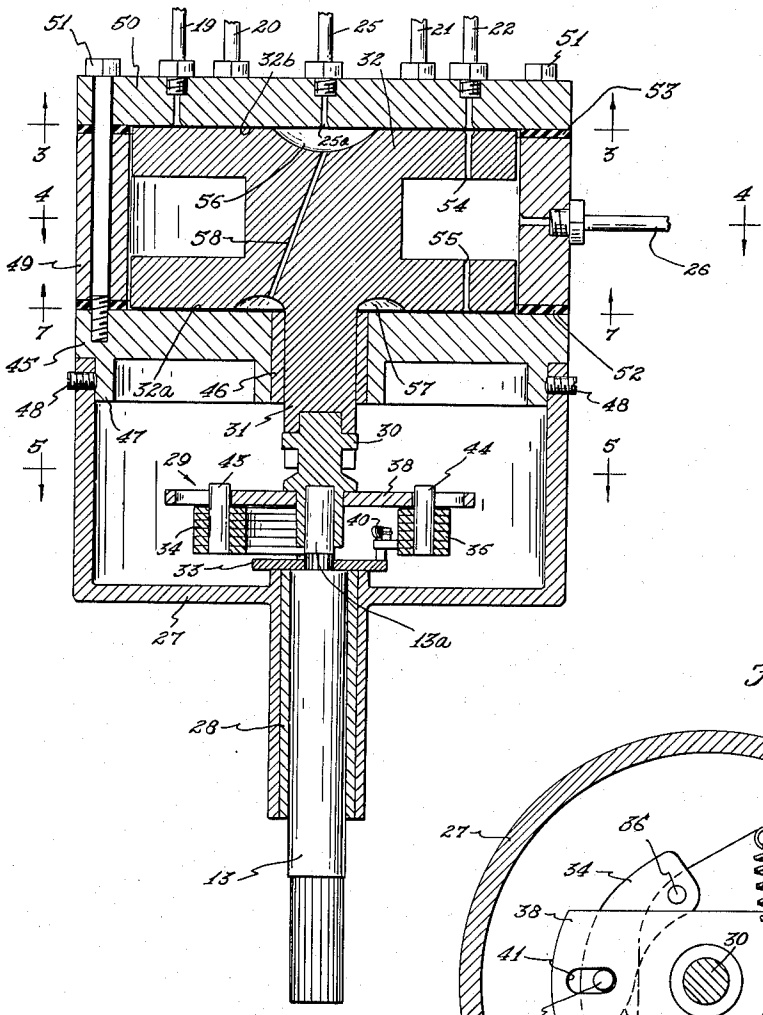
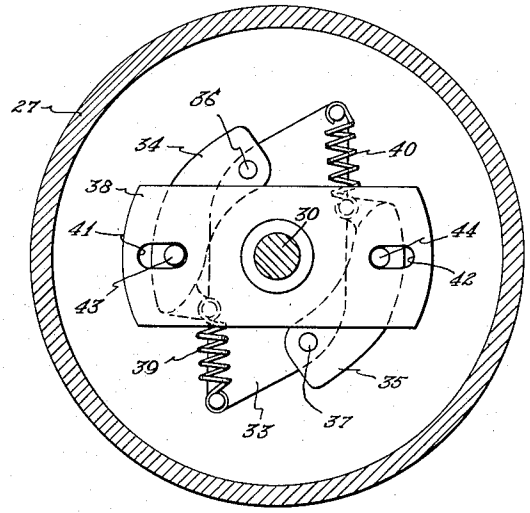



Fig. 5.




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April 17, 1956 R. L. GRAY ET AL 2,742,050

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Filed Aug. 18, 1952 3 Sheets-Sheet 3

Fig. 6.

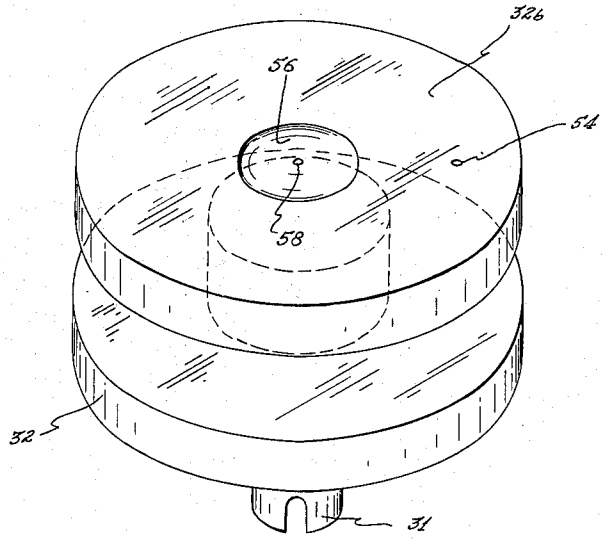
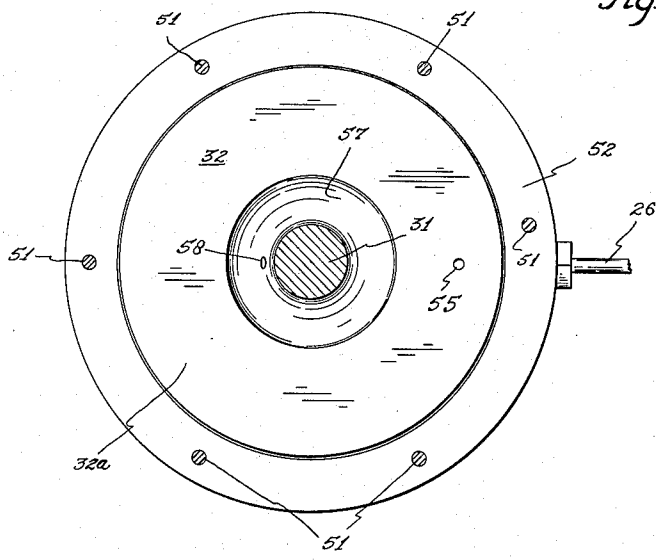



Fig. 7.




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2,742,050

# FUEL DISTRIBUTOR FOR DIESEL ENGINES

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Application August 18, 1952, Serial No. 305,054

2 Claims. (Cl. 137—312)

The present invention relates to improvements in a fuel distributor for diesel engines. In engines of this type, the fuel oil is fed into the cylinders of the engine by injecting the proper amount of fuel through an injector nozzle into the combustion chamber at the head of the cylinder. Our invention concerns itself particularly with the matter of delivering the fuel to the injector nozzle at the proper time. These engines usually have several cylinders and the fuel is supplied at the proper pressure by a suitable pump to a distributor unit which opens a passage from the pump to each individual cylinder at the proper time to cause the cylinders to fire in succession. In diesel engines with which we are familiar there is no simple reliable mechanism which will control the distribution of the fuel to the injector nozzles in such a way as to cause fuel ignition at the proper time for all speeds. It will be appreciated that there is a certain time delay between the time the distributor unit opens the passage to the injector nozzle and the actual ignition of the fuel in the combustion chamber. The delay is a fixed amount and is not changed by increasing or decreasing the speed of the engine.

It is the purpose of our invention to provide a simple distributor unit adapted to be inserted in the fuel line between a pump or other source of fuel under pressure and the several injector nozzles by which the fuel can be controlled and injected into the cylinders in such a way as to compensate for speed changes. The fuel ignition in the combustion chamber of a cylinder is started preferably when the piston is practically at the limit of its compression stroke. This is the point of highest compression. Ignition of the fuel in advance of this point may create a back pressure which robs the engine of its power. Ignition at a later point means loss of compression advantage before ignition. Assuming that the distribution arrangement for the fuel is proper for a given speed, any change in speed will cause the fuel injection to start too early or too late. If the speed is increased, the time delay being fixed, will cause later injection of the fuel than the desired optimum. If the engine is slowed down, the injection is earlier than it should be.

Specifically it is the purpose of our invention to provide a simple distributor which is operated from the engine and which has individual connections to the several engine cylinders, the distributor embodying a balanced spool shaped rotor which is coupled to the driving mechanism from the engine so as to advance with respect to the drive mechanism upon increased speed of the engine, the rotor being confined between two bearing plates, one of which has the necessary apertures leading to the conduits to the injection nozzles of the engine, and the rotor being surrounded by a cylinder between the plates to provide a reservoir to which the pump may supply fuel at the required pressure. Our invention embodies means to distribute the fuel oil to both end faces of the rotor so that the rotor runs in the fuel oil and the bearing faces at the ends of the rotor serve to seal the fuel oil from the distributor outlets except when the rotor is positioned, with respect to any outlet, to pass its fuel directly into the outlet from the reservoir.



The nature and advantages of our invention will appear more fully from the following description and the accompanying drawings. It should be understood however, that the drawings and description are illustrative only and are not intended to limit the invention except insofar as it is limited by the claims.

In the drawings:

Figure 1 is a somewhat diagrammatic view in side elevation of a diesel engine to which our invention is applied;

Figure 2 is an enlarged vertical sectional view through the distributor unit embodying our invention;

Figure 3 is a sectional view taken on the line 3—3 of Figure 2;

Figure 4 is a sectional view taken on the line 4—4 of Figure 2;

Figure 5 is a sectional view taken on the line 5—5 of Figure 2;

Figure 6 is a perspective view of the rotor of our improved distributor unit; and

Figure 7 is a fragmentary sectional view taken on the line 7—7 of Figure 2.

Referring now to the drawing, in Figure 1 a diesel engine **8** with six cylinders is shown diagrammatically. The fuel supply to the engine is through a conduit **9** to a pump unit **10** which is so constructed and arranged as to supply fuel under the proper pressure through a valve **11** to a distributor unit **12** embodying our invention. The distributor unit **12** is driven by a shaft **13** from a gear box **14**. Power is supplied to the gear box **14** by a shaft **15** that is driven from the drive shaft of the engine **8** in any suitable manner. In the present instance, we have shown the pump **10** and the shaft **15** driven from a common shaft **16** that is coupled by a belt **17** to the crank shaft **18** of the engine **8**. The particular pump construction and the fuel supply connections to the pump form no part of our invention. Our invention is embodied in the distributor unit **12** and its connections indicated at **19**, **20**, **21**, **22**, **23** and **24** to the several cylinders of the engine **8**, a leakage connection **25** from the distributor unit to the fuel supply line and the fuel supply connection **26** from the pump to the distributor unit.

The particular construction of the distributor unit is shown most clearly by the detail views in Figures 2 to 7 inclusive. The distributor unit embodies a housing **27** which is cup shaped and which has a bearing sleeve **28** through which the shaft **13** extends. At the top of the shaft **13** a centrifugally operated connecting mechanism **29** is provided between the shaft **13** and a coupler member **30** which is connected to a stub shaft **31** on the rotor **32** of the distributor. The centrifugally operated mechanism **29** comprises a base member **33** which is non-rotatably mounted on the shaft **13**, two weighted arms **34** and **35** pivoted by pivot pins **36** and **37** to the member **33** and a plate **38** fixed on the coupler member **30**. The weights **34** and **35** have their free ends connected to the base member **33** by springs **39** and **40**. The plate **38** has elongated slots **41** and **42** therein, receiving pins **43** and **44** on the weights **34** and **35**. The slots **41** and **42** are so arranged that as the weights **34** and **35** swing outward as shown in Figure 5 of the drawings, the plate **38** and the coupling member **30** will be rotated in a clockwise direction with respect to the base **33** and the shaft **13**. The coupling member **30** and the plate **38** are rotatably mounted on the reduced extension **13a** of the shaft **13**.

The housing member **27** supports a lower plate **45** which has a bearing sleeve **46** for the rotor shaft **31**. The plate **45** is removably supported on the housing **27** by a flange **47** that fits inside the housing **27** and is secured

by screws 48. A spacing cylinder 49 and a top plate 50 are bolted to the plate 45 by bolts 51. Sealing gaskets 52 and 63 are employed to seal the joint between the cylinder 49 and the plates 45 and 50.

The plate 50 has fuel passages 19*a*, 20*a*, 21*a*, 22*a*, 23*a*, 24*a*, and 25*a* therethrough connecting with each of the conduits 19–25 inclusive. The passages 19*a* to 24*a* at their inner ends are elongated circumferentially of the plate 50 as illustrated in Figure 3, in order that a fuel delivering passage 54 in the rotor 32 may remain in register with each passage long enough to supply the necessary charge of fuel.

The rotor 32 is spool shaped and has bearing faces 32*a* and 32*b* bearing on the adjacent plates 45 and 50 respectively. The rotor has a passage 55 opposite the passage 54 so that fuel oil entering through the conduit 26 into the reservoir between the upper and lower flanges of the rotor 32 will communicate with both bearing surfaces 32*b* and 32*a*. The rotor 32 is hollowed out at 56 at the top and at 57 at the bottom so that any leakage of the fuel oil inward from the passages 54 and 55 will flow into the depressions created at 56 and 57. A passage 58 through the rotor connects the depressions created at 56 and 57 and the passage 25*a* in the plate 50 conducts away any leakage fuel. The conduit 25 is connected to the inlet conduit 9 through a valve 59 shown on Figure 1.

The operation of our improved distributor is believed to be apparent from the foregoing description. The distributor unit will contain a supply of fuel oil at all times in the reservoir provided between the flanges of the rotor 32. The pump 10 pumps the fuel through the conduit 26 into this reservoir. When the rotor is turned by the shaft 13, the passage 54 will feed fuel successively to the passages 19*a* to 24*a* inclusive so as to supply the fuel under pressure to the several cylinders of the engine. The rotor 32 is balanced between the plates 45 and 50 since the fuel oil pressure is the same throughout the space around the rotor. Any leakage of fuel oil across the bearing faces 32*a* and 32*b* is trapped in the depressions 56 and 57 and will return to the pump inlet through the conduit 25. The rotor is thus free to rotate with a minimum amount of resistance. There is a fixed time delay between the opening of one of the passages 19*a* to 24*a* to the passage 54 and the actual ignition of the fuel oil in the combustion chamber of the engine. If the engine speeds up, the mechanism 29 will advance the rotor shaft 31 with respect to the drive shaft 13 to compensate for the effect of this time lag upon the increased speed.

The particular construction of our improved distributor unit is important in its operation. The engagement between the plates 45 and 50 and the rotor faces 32*a* and 32*b* must be maintained. The constant pressure of the fuel oil tends to force the fuel oil between the plates and the rotor faces. The end faces 32*a* and 32*b* of the rotor 32 are preferably hardened and polished to minimize wear on the rotor and to reduce friction. The plates 45 and 50 may have hardened surfaces too. The engaging faces of the plates and the rotor are flat surfaces and can be kept to a very close tolerance by simple flat grinding and polishing whenever they become worn. The entire construction is such that the distributor unit may be taken apart and repaired with a minimum of difficulty.

The nature and advantages of our invention are believed to be clear from the foregoing description.



Having thus described our invention, we claim:

1. A fuel distributor for multiple cylinder engines comprising a spool-shaped rotor having a central annular channel, a cylinder surrounding said rotor, and cooperating therewith to form an annular fuel reservoir, end plates having flat parallel surfaces facing each other, bolts clamping said cylinder between the surfaces thereby closing the cylinder and positioning said surfaces to act as bearing faces for the ends of said rotor, the rotor having a drive shaft projecting from one end and the adjacent plate having a bearing for said shaft, the other plate having circumferentially spaced apertures therethrough equidistant from the axis of the rotor, conduits leading from said apertures, the rotor having a passage leading from said annular channel to each end face to carry fuel oil to the bearing faces of said plates, the rotor passage to the end plate having said apertures opening to said plate at the same distance from the rotor axis as said apertures so that when the rotor passage aligns with one of said apertures, fuel oil can flow through the passage and aperture into the conduit, and said cylinder having a fuel oil inlet to said channel, said rotor having depressions in the ends thereof spaced radially inward from the passages and an aperture through the rotor connecting said depressions, one of said end plates having an aperture opening to one of said depressions and a conduit leading from said last named aperture for carrying away fuel oil collecting in said depressions.

2. A rotary fuel distributor for multiple cylinder engines comprising in combination a shell having a cylindrical interior, a spool shaped rotor in said shell and having end faces bearing on the inner faces of the ends of said housing and thereby providing with said housing an annular reservoir for holding a supply of liquid fuel, said rotor having a drive shaft projecting from one end through the housing and substantially sealed off from the reservoir by the surrounding bearing surfaces of said rotor and the shell, the shell having fuel outlet apertures in the end opposite the first named end of the rotor, said apertures being equally spaced circumferentially about the axis of the cylindrical interior as a center, said apertures being substantially sealed off from the reservoir by the adjacent bearing surfaces of said rotor and the shell, the rotor having passages through the flanges spaced from the said axis the same distance as the fuel outlet apertures whereby to pass liquid fuel from the reservoir to the end faces of said rotor and to said apertures, the rotor having depressions in the ends thereof spaced inward from said passages for accumulating any leaking fuel, said rotor having a passage therethrough inwardly of the reservoir connecting said depressions and the shell having a central outlet aperture in the end having said first named apertures.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 1,030,604 | Nilsen | June 25, 1912 |
| 1,766,908 | Kindl | June 24, 1930 |
| 2,050,392 | Starr | Aug. 11, 1936 |
| 2,182,459 | Vickers | Dec. 5, 1939 |
| 2,223,590 | Alden | Dec. 3, 1940 |
| 2,483,949 | Washington | Oct. 4, 1949 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 402,502 | Great Britain | Dec. 7, 1933 |