Jan. 19, 1960 W. L. BENNETT 2,921,529

FUEL INJECTION SYSTEM PUMP

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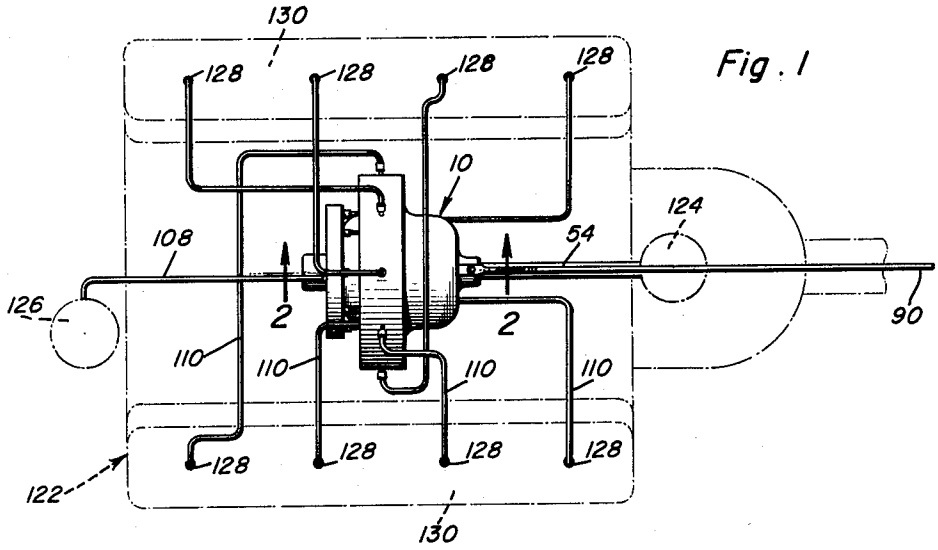


Fig. 1

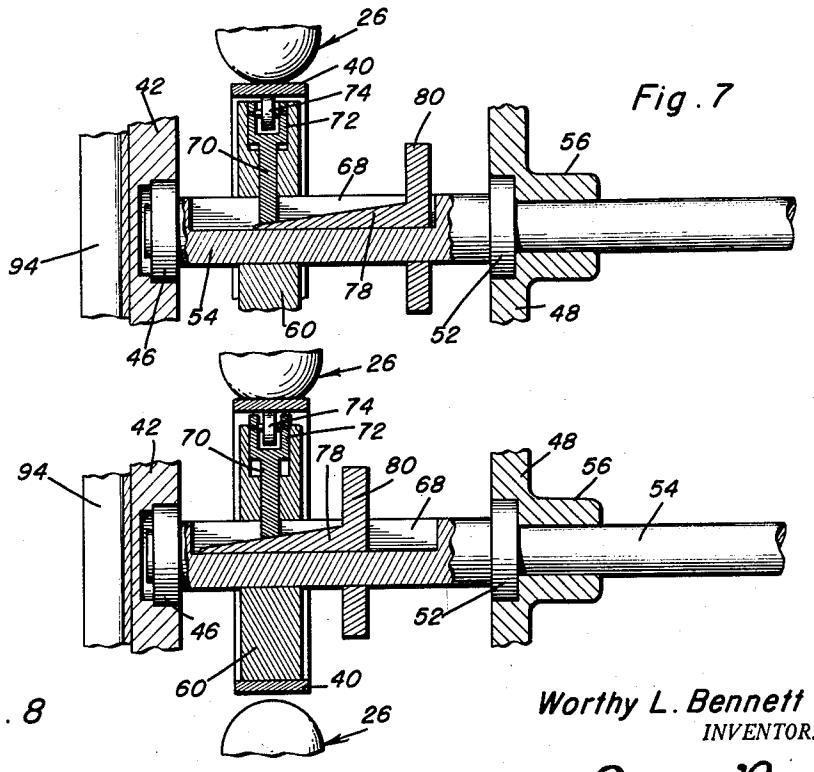


Fig. 7

Fig. 8

Worthy L. Bennett
INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

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Fig. 2

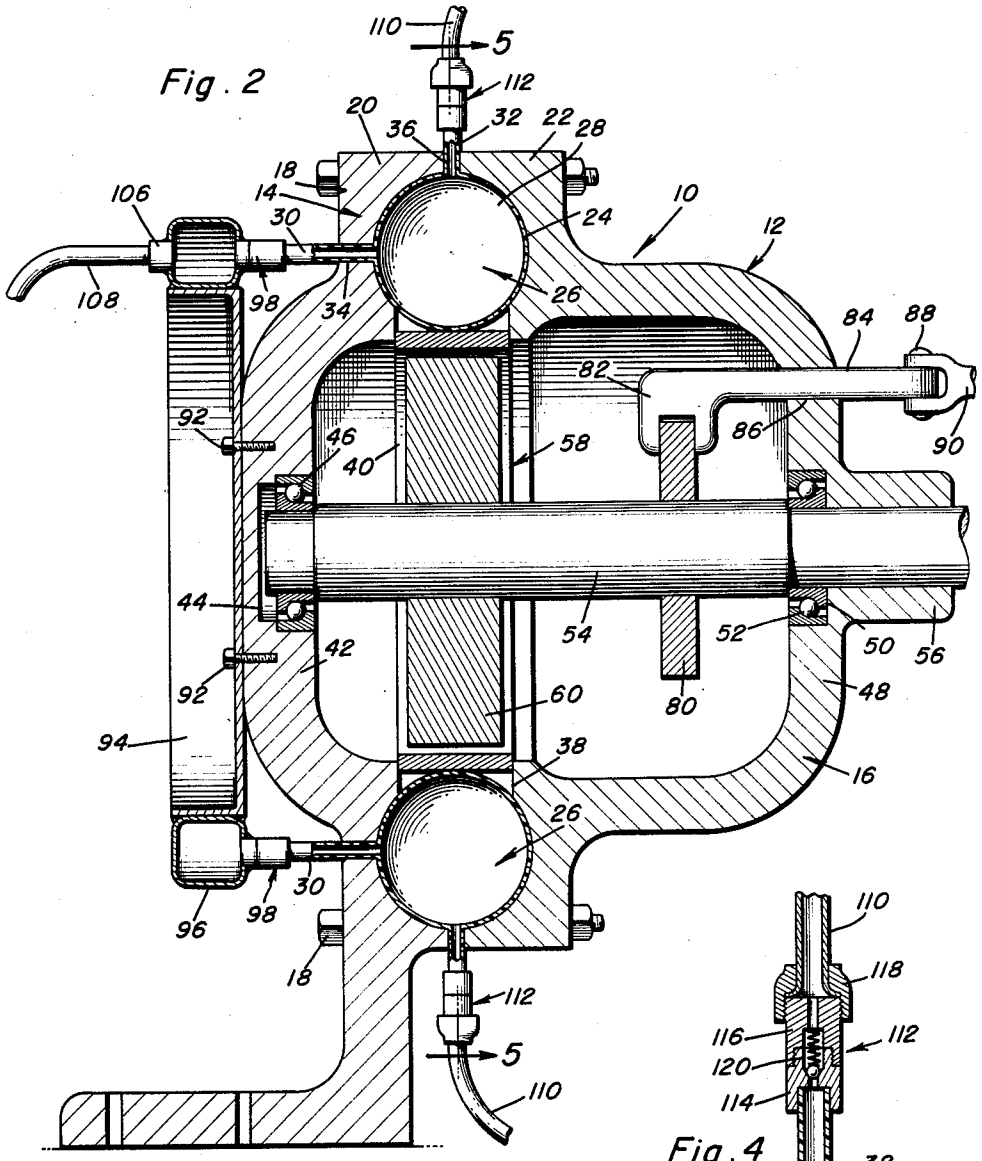
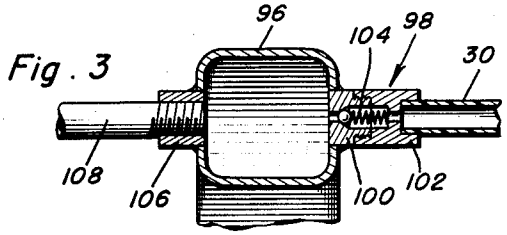


Fig. 4

Fig. 3



Worthy L. Bennett
INVENTOR.

BY Thomas A. O'Brien and Harvey B. Jacobson
Attorneys

Jan. 19, 1960 W. L. BENNETT 2,921,529

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Fig. 5

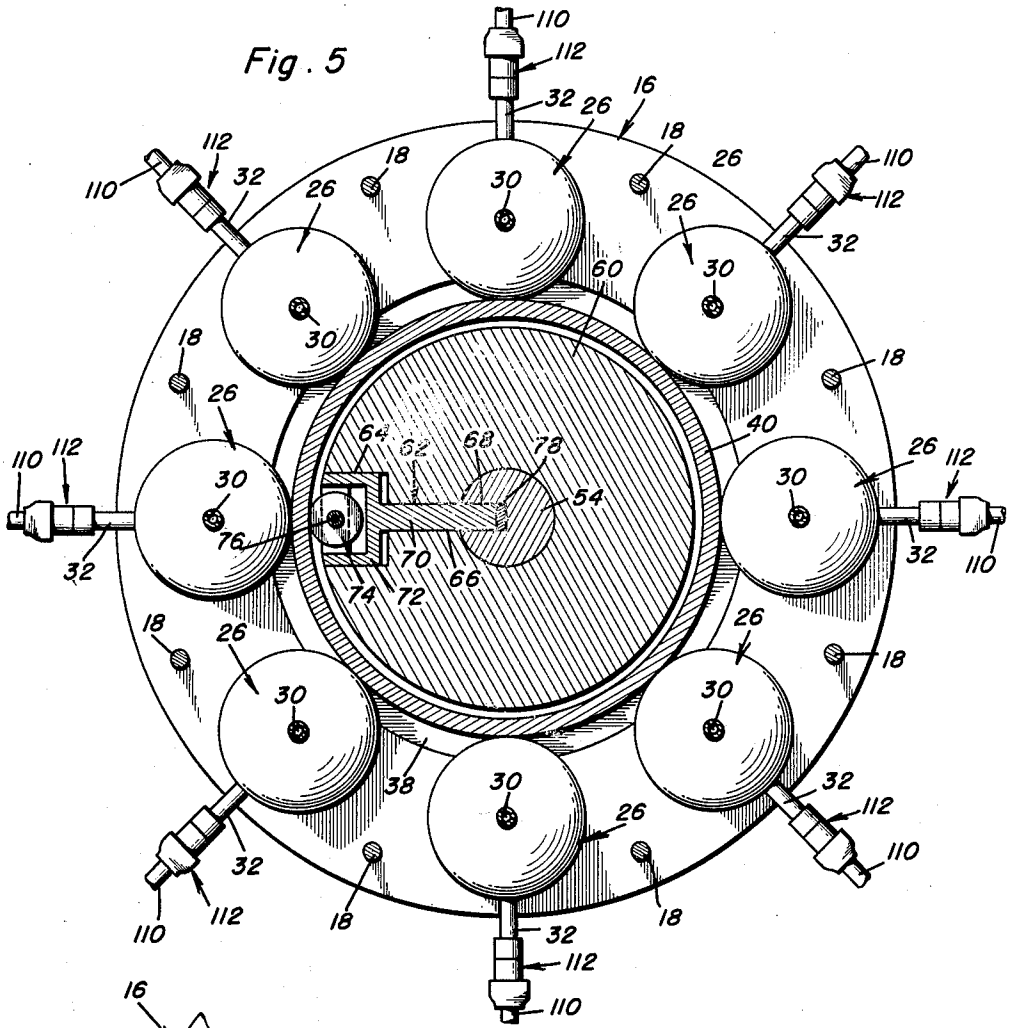
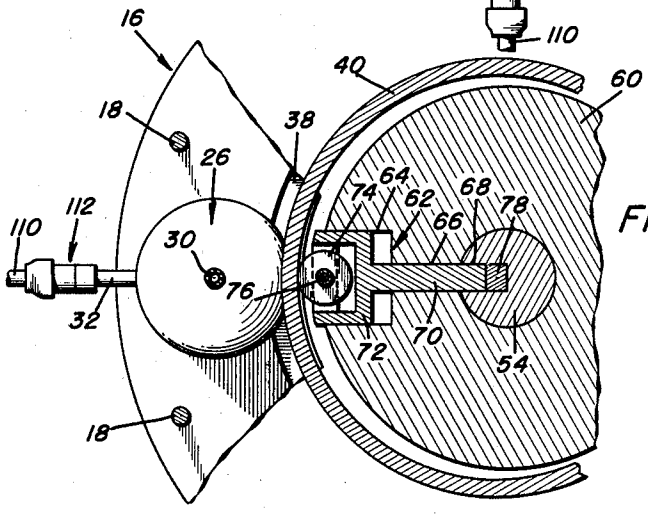


Fig. 6



Worthy L. Bennett
INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

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FUEL INJECTION SYSTEM PUMP

Worthy L. Bennett, Cottonwood, Ariz., assignor of one-fourth to K. Norton, Cottonwood, Ariz.

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3 Claims. (Cl. 103—38)

This invention relates in general to new and useful improvements in pumps, and more specifically to improvements in pumps of the variable output type.

The primary object of this invention is to provide an improved pump of the variable output type, the pump including a plurality of pump units mounted in a housing in concentric circumferentially spaced relation with respect to a shaft carried by the housing, there being provided drive means on the shaft which is adjustable for varying the effective stroke of the individual pump unit so as to vary the output of the pump.

Another object of this invention is to provide an improved pump, the pump including a housing having carried thereby a shaft, there being also carried by the housing in concentric relation with respect to the shaft a plurality of circumferentially spaced pump units, a floating annular member engaging said pump units and being disposed about the shaft, there being carried by the shaft a drive member engaging the annular member and causing movement of the annular member in an eccentric path so as to sequentially actuate said pump units.

Another object of this invention is to provide an improved pump which utilizes a plurality of individual pump units of the bulb type, each of the pump units being continuously engaged by a free floating annular member, there being carried by the housing a drive shaft including cam type drive means engaged with the annular member for effecting movement of the annular member in a concentric path whereby the bulb type pump units are sequently compressed and released so as to effect a pumping action.

A further object of this invention is to provide an improved fluid pump of the variable capacity type which is suitable for use in conjunction with a fuel injection system or the like, the pump including a plurality of individual pump units and there being provided drive means for the individual pump units which is adjustable so as to vary the effective stroke and output of the individual pump units.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinfater described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

Figure 1 is a schematic plan view of an internal combustion engine which is shown in dotted lines and which has mounted thereon the pump which is the subject of this invention as part of a fuel injection system thereof;

Figure 2 is an enlarged fragmentary longitudinal sectional view taken substantially upon the plane indicated by the section line 2—2 of Figure 1 and shows the specific internal construction of the pump;

Figure 3 is an enlarged fragmentary sectional view taken through an upper part of a supply manifold for the pump and shows both the connection of one of the pump units to the supply manifold and a supply line to the manifold;

Figure 4 is an enlarged fragmentary sectional view taken through an outlet of one of the pump units and shows the details of an outlet valve and the connection of the outlet of the pump unit to a discharge line;

Figure 5 is an enlarged transverse sectional view taken substantially upon the plane indicated by the section line 5—5 of Figure 2 and shows further the details of the pump;

Figure 6 is an enlarged fragmentary sectional view showing a portion of the pump unit as illustrated in Figure 5 with the effective stroke of the pump being increased;

Figure 7 is a fragmentary longitudinal sectional view taken through the center of the pump and shows the cam type drive member as being in a position of minimum stroke; and

Figure 8 is a fragmentary longitudinal sectional view similar to Figure 7 and shows the cam type drive member in a position of substantially maximum stroke.

Referring now to the drawings in detail, it will be seen that there is illustrated the pump which is the subject of this invention, the pump being referred to in general by the reference numeral **10**. The pump **10** includes a housing which is referred to in general by the reference numeral **12**. The housing **12** is formed in two halves **14** and **16**, the housing **12** being split transversely. The halves **14** and **16** are releasably clamped together by means of longitudinally extending bolts **18** which are circumferentially spaced and which are best illustrated in Figure 5.

The housing halves **14** and **16** have relatively thick abutting flange portions **20** and **22**, respectively, which are internally recessed to form a plurality of pockets **24** which are circumferentially spaced. Seated in each of the pockets **24** is a bulb type pump unit which is referred to in general by the reference numeral **26**. Each bulb type pump unit **26** includes a spherical bulb member **28** which may be formed of any flexible resilient material including metal, rubber or plastic. Each of the bulb members **28** has formed integrally therewith an inlet tube **30** and a discharge tube **32**. The inlet tube **30** and the discharge tube **32** of each of the pump units **26** are disposed at right angles to each other with each inlet tube **30** being disposed in a longitudinal bore **34** in the flange **20** and each discharge tube **32** being disposed in a radial bore **36** between the flanges **20** and **22**.

Aligned with the pockets **24** and extending into the interior of the housing **12** is an annular trackway **38**. Seated in the annular trackway **38** for floating movement is an annular member **40**. The annular member **40** engages the pump unit **26** and is shiftable so as to compress the bulbs **28** and effect a pumping operation.

The housing half **14** includes an end wall **42** having a recess **44** in which there is mounted a bearing **46**. The housing half **16** includes an end wall **48** having a recess **50** in which there is mounted a bearing **52**. The bearings **46** and **52** are aligned and have rotatably journaled therein a drive shaft **54**. The drive shaft **54** has one end thereof terminating in the end wall **42** and the opposite end thereof projecting through a boss **56** carried by the end wall **48**.

Carried by the shaft **54** within the housing **12** is a cam type drive unit which is referred to in general by the reference numeral **58**. The cam type drive unit **58** includes a circular support **60** which is mounted in alignment with the annular member **40**. As is shown in Figure 5, the support **60** is provided with a radially extending recess **62** which includes a relatively wide outer portion **64** and a narrower inner portion **66**. The recess **62** is aligned with a longitudinally extending trackway **68** formed in the shaft **54**.

Disposed within the recess **62** for radial movement is

a support arm 70 whose inner end projects into the trackway 68. The outer end of the support arm 70 is in the form of a support head 72 which carries a roller 74. The roller 74 is mounted on a longitudinally extending shaft 76 and the roller 74 engages the internal surface of the annular member 40.

In order that the roller 74 may be selectively positioned, there is positioned within the trackway 68 a wedge member 78. The wedge member 78 is provided at the end thereof remote from the support 60 with a circular collar 80. Engaged with the circular collar 80, as is best shown in Figure 2, is a bifurcated head 82 of a shift member 84. The shift member 84 is journaled for longitudinal sliding movement in an opening 86 in the end wall 48. In order that the member 78 may be positioned from a remote point, there is pivotally connected to the shift member 84 by means of a pivot pin 88 a control link 90.

As is best shown in Figure 5, the annular member 40 is of an outer diameter so as to engage all of the bulb members 28 without substantially compressing them. This is a shut-off position of the pump 10. When it is desired for the pump 10 to pump, the wedge member 78 is shifted longitudinally to the left, as viewed in Figures 7 and 8, and as a result, the roller 74 is shifted outwardly from the axis of the shaft 54. This causes an eccentric movement of the annular member 40 when the shaft 54 rotates so that the bulb members 28 are progressively and sequentially compressed in the least.

Referring once again to Figure 2 in particular, it will be seen that there is secured to the end wall 42 by means of fasteners 92 a support bracket 94. The support bracket 94 carries an annular supply manifold 96 which is provided with a plurality of circumferentially spaced fittings which are referred to in general by the reference numeral 98. Each fitting 98 includes a fixed part 100 carried by the manifold 96 and a removable part 102 carried by the associated one of the inlet tubes 30. This permits the connection and uncoupling of the individual pump units 26 to the supply manifold 96. Positioned within each of the fittings 98 is a check valve assembly 104 of the spring loaded type, which check valve assembly permits the flow of a liquid of the manifold 96 into one of the inlet tubes 30 only.

In order that a liquid may be supplied to the supply manifold 96, the manifold 96 also includes an inlet fitting 106. The inlet fitting 106 has connected thereto a supply line 108, as is best shown in Figure 3.

Referring now to Figure 4 in particular, it will be seen that there is illustrated a connection between one of the discharge tubes 32 and a discharge line 110. The connection includes a fitting which is referred to in general by the reference numeral 112. The fitting 112 includes a half 114 carried by the discharge tube 32 and which is releasably coupled to a half 116. The half 116 includes a retaining nut 118 which in turn clamps the discharge line 110 to the half 116. Positioned within the fitting 112 is a spring loaded check valve 120 which permits flow in one direction only, the direction of flow being from the discharge tube 32 into the discharge line 110.

Referring now to Figure 1 in particular, it will be seen that the pump 10 is illustrated as being mounted on an internal combustion engine of the V–8 type, the engine being referred to in general by the reference numeral 122. The engine 122 includes a distributor 124 and the pump 10 will be driven from the distributor 124 in any desired manner. It will most likely be preferred that the shaft 54 go into a special adapter (not shown) mounted beneath the distributor 124. When the pump 10 is mounted in an automobile, the control link 90 will be connected to the conventional accelerator pedal. If desired, the supply line 108 may be connected to a fuel pump, such as the fuel pump 126 so that it may receive its fuel supply under pressure. The discharge lines 110 will be connected to injectors 128 carried by the halves 130 of the internal combustion engine 122.

Although the pump 10 is of a construction whereby it may be readily used as a fuel injection pump, it is to be understood that the use thereof is not so limited. The pump 10 may be used for pumping oils or other liquids and may be used in conjunction with any operation which requires a plurality of individual pump units which operate sequentially.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A pump comprising a housing, a shaft rotatably journaled in said housing, a plurality of individual pump units carried by said housing, said pump units each including a compressible bulb and being arranged concentrically about said shaft, inlet tubes and discharge tubes respectively including inlet and discharge check valves therein communicating with each of said bulbs, an annular supply manifold, each of said inlet tubes connected to said supply manifold, a free floating annular member mounted in said housing, said annular member being normally in engagement with all of said bulbs for actuating said pump units and being supported thereby, a cam type drive unit carried by said shaft and engaging said annular member to move said annular member in an eccentric path whereby said pump units are sequentially actuated, said cam type drive unit being of the adjustable type for varying the movement of said annular member and the stroke of said pump units, said cam type drive unit including a support member carried by said shaft, a support arm mounted in said support member for movement in a radial direction, a roller terminally and rotatably carried by said support arm engaging said annular member, and means engaged with said support arm for positioning said support arm radially of said shaft.

2. The combination of claim 1 wherein said last named means include a wedge member slidably along said shaft.

3. The combination of claim 1 wherein said last named means includes a longitudinal trackway in said shaft, one end of said support arm being disposed in said trackway, a wedge member positioned in said trackway for longitudinal sliding movement, said wedge member engaging said one end of said support arm.

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