March 27, 1951 E. A. WATSON 2,546,571

TEMPERATURE-COMPENSATED PRESSURE RESPONSIVE DIAPHRAGM

Filed April 30, 1945

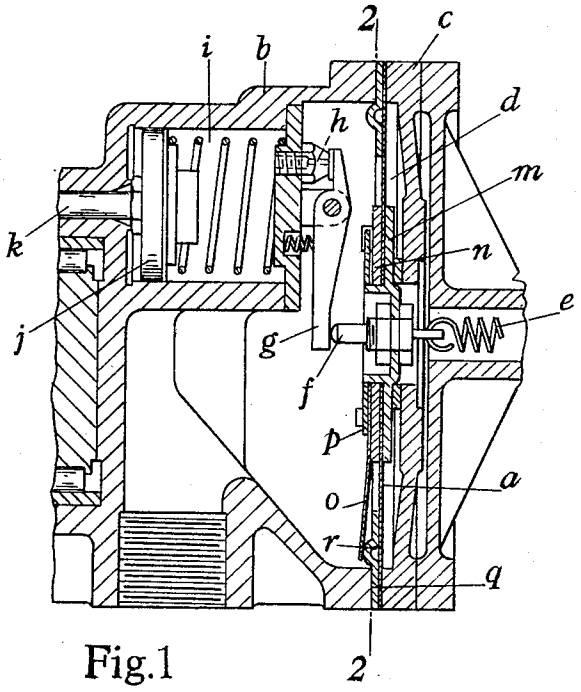


Fig.1

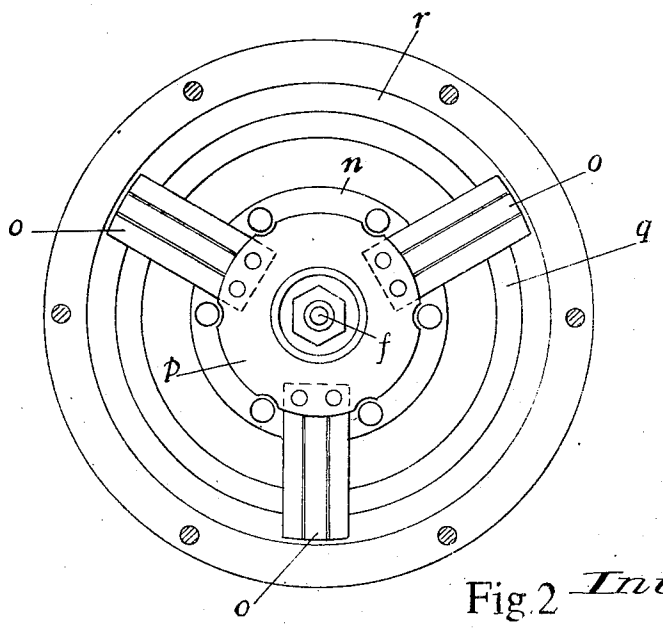


Fig.2

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TEMPERATURE-COMPENSATED PRESSURE-RESPONSIVE DIAPHRAGM

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2 Claims. (Cl. 137—157)

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This invention relates to variable delivery liquid fuel pumps of the type having combined therewith automatic governing means responsive to the action of fluid pressure depending on the speed of the pump, the said pressure being adapted to actuate a diaphragm forming a part of the governing means.

The object of the invention is to enable the effects of temperature changes on the density of the pressure fluid to be automatically compensated.

In the accompanying sheet of explanatory drawings:

Figure 1 is a sectional side view of a part of a swash plate pump embodying the invention.

Figure 2 is a section on the line 2—2 of Figure 1.

The pump illustrated in part by the drawings is similar to that described in the specification of prior patent application Serial No. 467,408 (R. J. Ifield and W. E. W. Nicolls, now Patent No. 2,403,371, dated July 2, 1946.

In the drawings *a* indicates a governing diaphragm having its outer peripheral portion clamped between an open end of the pump casing *b* and an annular member *c*, the latter forming with the diaphragm an annular chamber *d* for the governing liquid required to actuate the diaphragm. At its centre the diaphragm *a* is loaded by a spring *e*, and carries an abutment *f* through which the diaphragm can actuate a spring loaded lever *g* to control a vent *h* in one end of a cylinder *i* containing a spring loaded piston *j*, the latter being connected by a rod *k* to the swash plate (not shown) of the pump, and being movable in known manner by fluid pressure in response to movement of the vent-controlling lever by the diaphragm. The mode of connecting the rod *k* to the swash plate, the manner in which the governing liquid for actuating the diaphragm *a* is admitted to the chamber *d*, and the manner in which the piston *j* is movable by fluid pressure will be apparent from the prior specification above mentioned, and do not require further description here. The abutment *f* and the adjacent end of the spring *e* are secured to a circular metal plate *m* which closes a central hole in the diaphragm *a*, the portion of the diaphragm around this hole being clamped between the outer peripheral portion of the plate and a flat metal ring *n* which is secured to the plate in any convenient manner.

In carrying the invention into effect as shown, I secure to one side of the diaphragm *a* the inner ends of a plurality of radially mounted elastic

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bi-metal strips *o* of suitable stiffness, the said ends being situated between the flat ring *n* above mentioned and a securing ring *p*. In association with the same side of the diaphragm *a*, and concentrically therewith I secure a metal ring *q* formed with an annular ridge *r*, the latter serving as a fixed abutment for the outer ends of the strips *o*. The strips *o* are such that the constraint which they exert on the diaphragm *a* is variable with changes of temperature, and they are appropriately designed to compensate the effects of temperature on the density of the liquid acting on the diaphragm.

The governing liquid required to actuate the diaphragm *a* may be derived from a centrifugal pump combined in known manner with the swash plate pump, as described in the prior specification above mentioned and is supplied to the chamber *d* at a pressure dependent on the speed of the swash plate pump. An increase of temperature in the governing liquid delivered by the pump results in a diminution of the density of the governing liquid and a corresponding diminution of the pressure exerted by the liquid on the diaphragm *a* at any given speed. By virtue of the bi-metal strips *o* this change is accompanied by a corresponding diminution of the resistance to movement of the diaphragm *a* by the fluid pressure acting on it, so that the effect of temperature changes on the fluid is automatically compensated.

The invention is not, however, limited to the example above described as the essential feature of the invention may be embodied in a variety of forms.

Having thus described my invention what I do claim as new and desire to secure by Letters Patent is:

1. Means for automatically compensating the effects of temperature changes on the pressure of fluid acting on one side of a spring-loaded diaphragm, comprising the combination with the diaphragm, a chamber which has a wall formed by said diaphragm and into which the fluid required to act on said diaphragm can be introduced, and a loading spring attached to said diaphragm, of elastic thermally deformable bi-metal means arranged to act on said diaphragm so that increase in temperature of the fluid acting on said diaphragm causes said means to reduce the effect of said spring on said diaphragm.

2. Means as claimed in claim 1, in which said elastic thermally deformable means comprise a plurality of radially mounted elastic bi-metal strips having their inner ends secured to one

side of said diaphragm and their outer ends free, and having associated therewith a fixed annular abutment against which the free ends of said strips bear, said abutment being situated at the same side of said diaphragm as said strips.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
805,720	Fulton	Nov. 28, 1905
1,418,953	Martin	June 6, 1922
2,150,771	Kollsman	Mar. 14, 1939
2,161,743	Heinrich	June 6, 1939
2,235,314	Diggins	Mar. 18, 1941
2,292,125	Ifield	Aug. 4, 1942
2,299,234	Snader et al.	Oct. 20, 1942
2,376,892	Avigdor	May 29, 1945