Nov. 30, 1948. R. J. IFIELD 2,455,062

VARIABLE STROKE PUMP

Filed Dec. 29, 1944 2 Sheets-Sheet 1

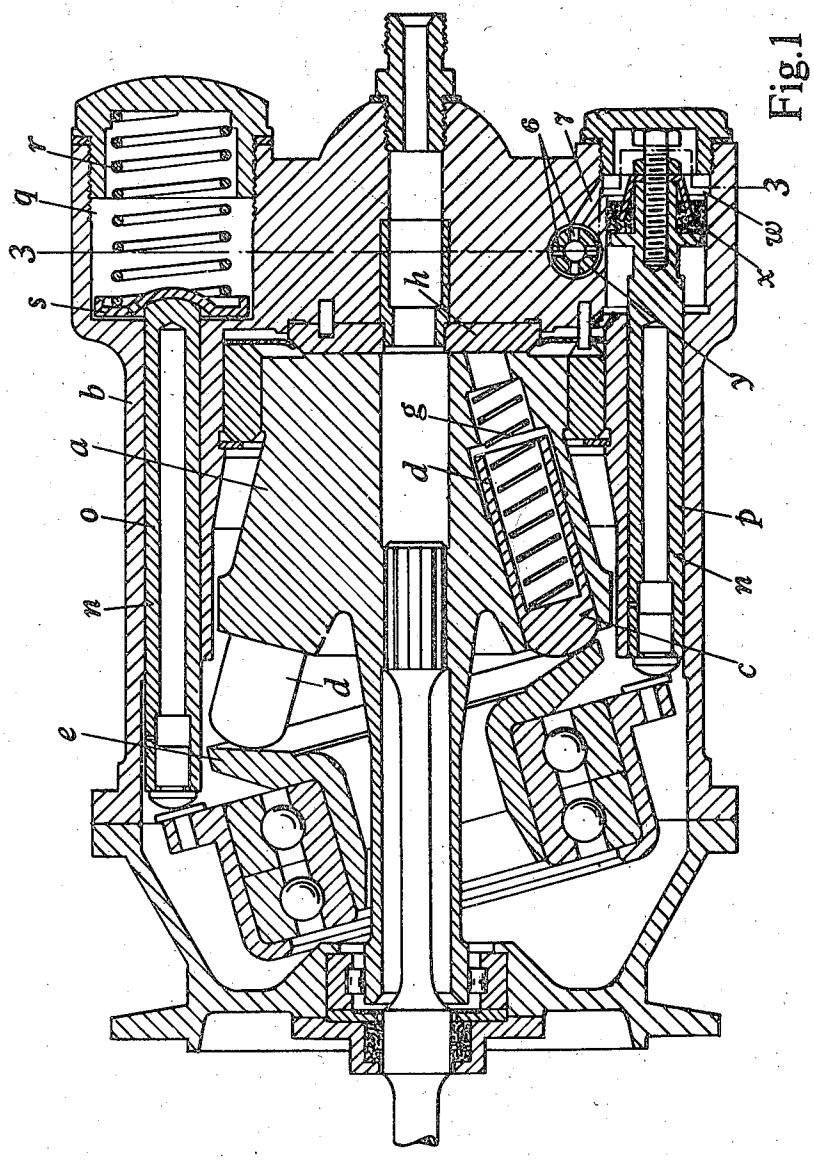

Fig. 1

Inventor
R. J. Ifield
By Glascock Downing & Seckel
Attys

Nov. 30, 1948. R. J. IFIELD 2,455,062

VARIABLE STROKE PUMP

Filed Dec. 29, 1944 2 Sheets-Sheet 2

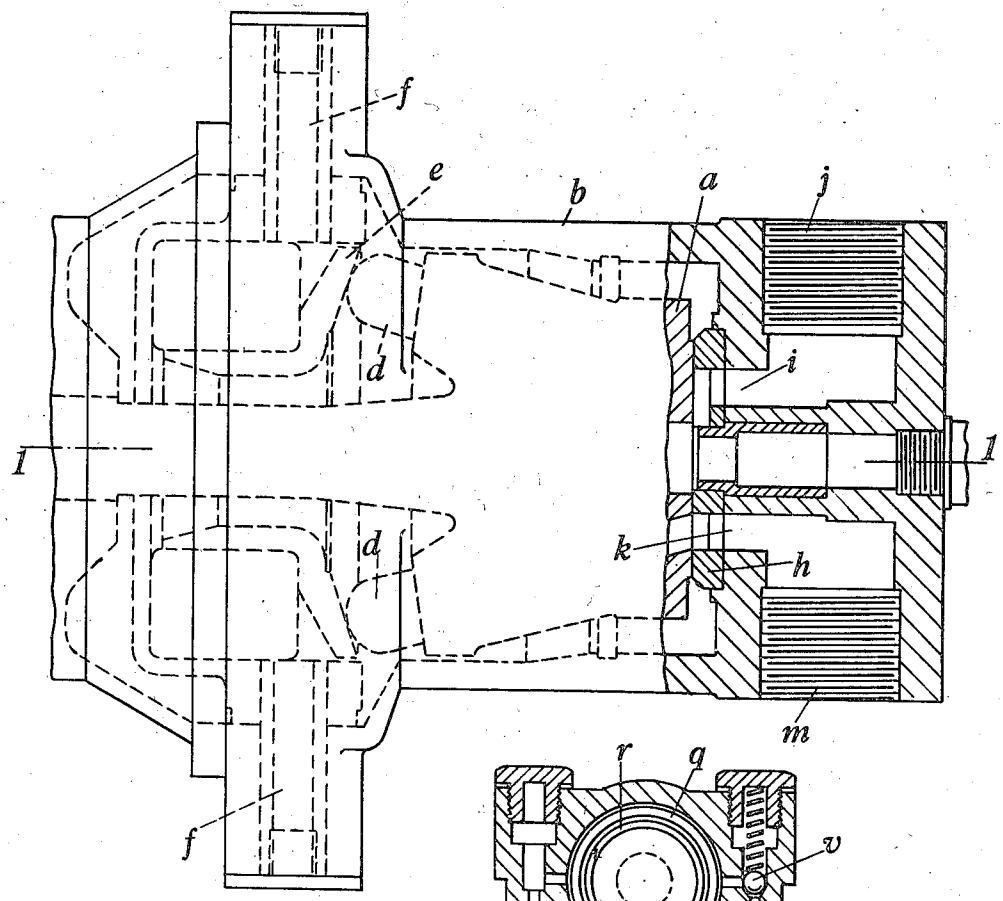

Fig.2

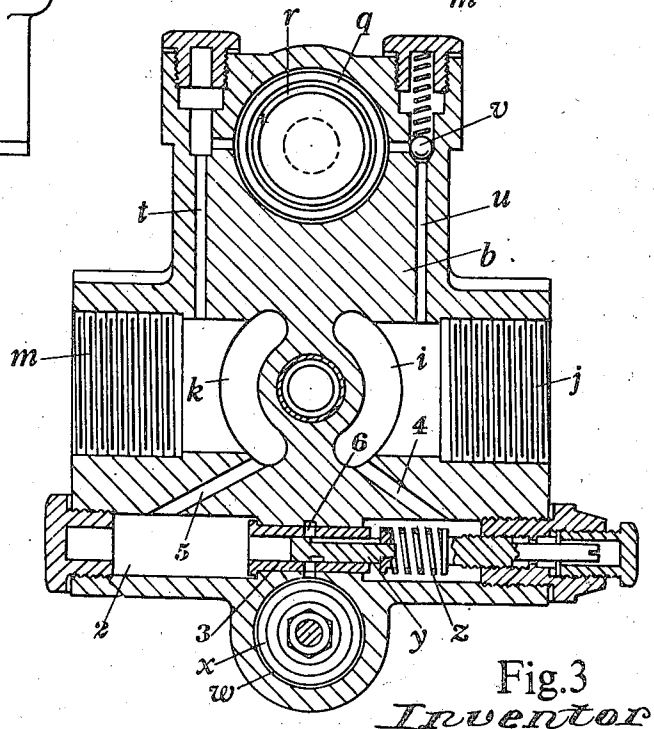

Fig.3

Inventor
R. J. Ifield
By Glascock Downing Seibold Attys

Patented Nov. 30, 1948

2,455,062

UNITED STATES PATENT OFFICE

2,455,062

VARIABLE STROKE PUMP

Richard Joseph Ifield, Ealing, London, England, assignor to Joseph Lucas Limited, Birmingham, England

Application December 29, 1944, Serial No. 570,439
In Great Britain July 12, 1943

1 Claim. (Cl. 103—162)

1

This invention relates to variable stroke pumps of the swash plate type, and has for its object to provide improved means for automatically varying the stroke in response to fluid pressure.

In the accompanying sheets of explanatory drawings:

Figure 1 is a sectional side elevation, Figure 2 a part sectional plan, and Figure 3 a sectional end elevation, of a variable stroke pump of the swash-plate type embodying the invention, Figure 1 being taken on the line 1—1 of Figure 2, and Figure 3 being taken on the line 3—3 of Figure 1.

The pump shown in the drawings comprises a rotary cylinder block *a* arranged in a casing *b* and having formed around its axis a plurality of bores as *c* in each of which is arranged a reciprocatory plunger *d*. The outer ends of the plungers *d* abut against a swash plate *e* which is pivotally supported in the casing *b* by trunnions *f*, and is movable about its pivot axis for altering the stroke of the plungers. During rotation of the cylinder block *a* the plungers *d* are moved in one direction by the swash plate *e* and in the opposite direction by springs as *g*, the latter being situated within the bores *c*, and serving to hold an end face of the cylinder block in contact with a flat seating *h* in the casing *b*. The seating *h* is formed with a port *i* communicating with the pump inlet *j*, and with another port *k* communicating with the pump outlet *m*, the pump inlet and outlet being provided in opposite sides of one end of the casing *b*.

In applying the invention in the manner shown in the drawings to the pump above described, I mount in bores *n* in the casing *b* a pair of controlling plungers *o*, *p* for imparting opposite angular movements to the swash plate *e*, the plungers being adapted to act on the swash plate at opposite sides of its pivot axis. At the end of the controlling plunger *o* remote from the swash plate *e* there is formed in the casing *b* a chamber *q*, and in this chamber is arranged a spring *r* which acts on the plunger through the medium of a thrust piece *s*, and which is adapted to move the plunger and swash plate in the direction for increasing the stroke of the pump plungers *d*. When the pump is required to operate under high delivery pressure I preferably arrange that the chamber *q* shall also communicate by a passage *t* with the pump outlet *m*. The pressure to which the plunger *o* is then subjected is the sum of the spring and delivery fluid pressures. For convenience of manufacture and to enable the pump to operate in either direction of rotation, the chamber *q* may also be connected by

2

another passage *u* to the pump inlet *j*, this passage being closed by a removable non-return valve *v* or a plug. At the corresponding end of the other controlling plunger *p* there is formed in the casing *b* a cylindrical chamber *w* containing a piston *x* formed on or otherwise associated with the plunger and of appropriately larger diameter than the plunger, the latter serving to move the swash plate *e* (under the action of fluid pressure on the piston) in the direction for reducing the stroke of the pump plungers *d*. The chamber *w* is adapted to communicate with the pump inlet *j* and outlet *m* under the automatic control of a piston valve *y* which is loaded by an adjustable spring *z*. To accommodate the valve *y* the casing *b* is formed with a transverse bore 2, and in the centre of this bore is secured a coaxial bush 3 in which the valve is slidably mounted. The parts of the bore 2 situated at opposite ends of the bush 3 are respectively connected to the pump inlet *j* and outlet *m* by passages 4, 5 in the casing *b*. Also the bush 3 is provided with ports 6 which serve under the control of the valve *y* to control communication of the pump inlet *j* and outlet *m* with another passage 7 formed in the casing *e* and leading to the chamber *w*.

The pressure acting on the controlling plunger *p* having the piston *x* associated with it depends on the position of the piston valve *y*. At low pump delivery pressures, the valve *y* is in the position shown in Figure 3 in which it effects communication of the piston chamber *w* with the pump inlet *j*. But when a predetermined pump delivery pressure is exceeded this pressure moves the valve *y* in opposition to its spring *z* into a position in which it establishes communication between the pump outlet *m* and the piston chamber *w*. The fluid pressure now acting on the piston *x* moves the swash plate *e* in the direction for reducing the pump plunger stroke, and this motion is continued until a state of balance is reached.

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

A variable stroke pump comprising in combination a casing, a rotary cylinder block mounted in the casing, plungers slidable in the cylinder block, a pivotally mounted swash plate adapted by co-operation with the plungers to impart movement thereto during rotation of the cylinder block, and also to vary the stroke of the plungers, an inlet through which fluid can flow into the cylinder block in response to movement of the plungers in one direction, an outlet through

which fluid can be delivered by movement of the plungers in the opposite direction, a pair of additional plungers adapted to impart opposite movements to the swash plate, a spring acting on one of the additional plungers, a chamber at one end of the other additional plunger, a piston slidable in the chamber and adapted to act on the associated additional plunger, a spring loaded valve responsive to the delivery pressure of the pump, and a pair of fluid passages which are respectively connected to the inlet and outlet and which are alternatively connectible to the said chamber under the control of the valve.

RICHARD JOSEPH IFIELD.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
Re. 21,758	Foisy	Apr. 1, 1941
2,129,886	Syrovy	Sept. 13, 1938
2,177,098	Doe et al.	Oct. 24, 1939
2,292,125	Ifield	Aug. 4, 1942
2,299,235	Snader et al.	Oct. 20, 1942