

May 4, 1943.

M. E. CHANDLER

2,318,292

FLUID PUMP

Filed Aug. 21, 1941

2 Sheets-Sheet 1

Fig. 1.

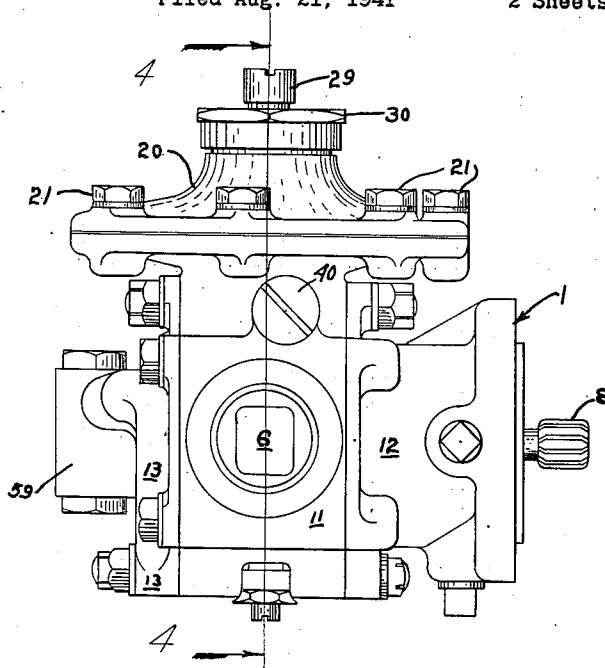
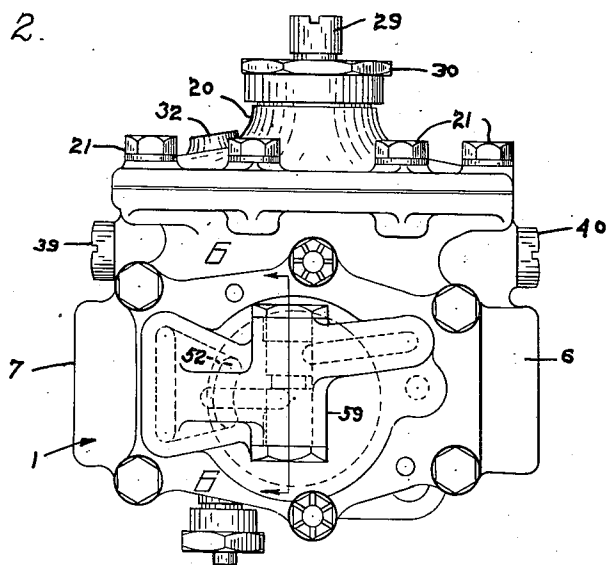


Fig. 2.



INVENTOR
MILTON E. CHANDLER

By *[Signature]*
ATTORNEY

May 4, 1943.

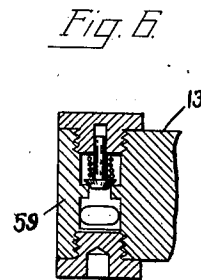
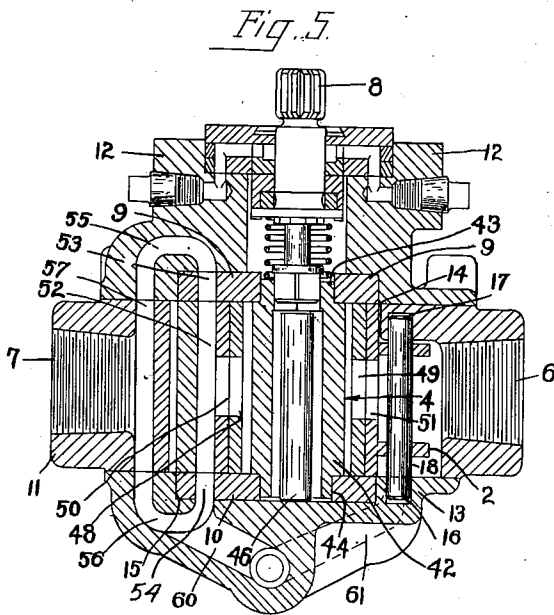
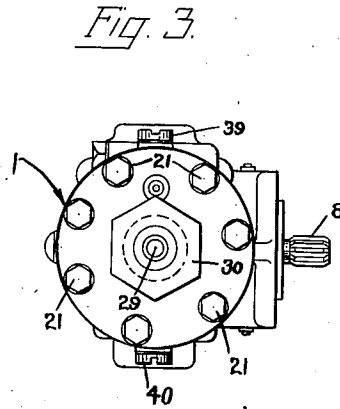
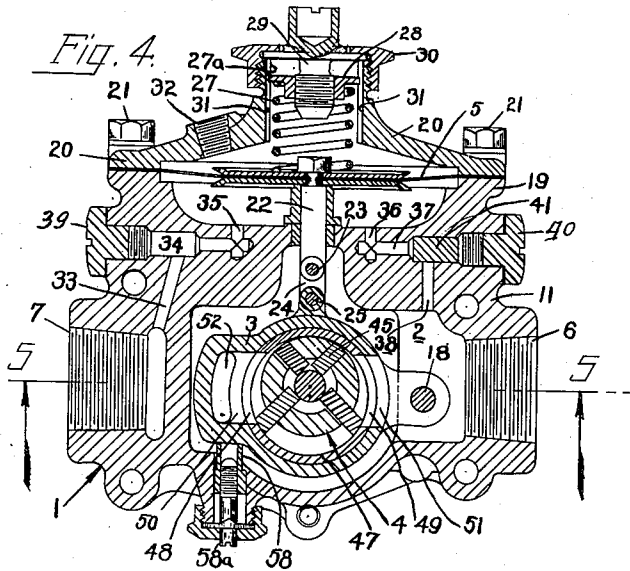
M. E. CHANDLER

2,318,292

FLUID PUMP

Filed Aug. 21, 1941

2 Sheets-Sheet 2



INVENTOR
MILTON E. CHANDLER

By *[Signature]*
ATTORNEY

UNITED STATES PATENT OFFICE

2,318,292

FLUID PUMP

Milton E. Chandler, New Britain, Conn., assignor
to Chandler-Evans Corporation, a corporation
of Delaware

Application August 21, 1941, Serial No. 407,798

6 Claims. (Cl. 103—120)

My invention relates to fluid pumps.

It has among its objects to provide an improved fluid pump of the variable capacity type and, more particularly, such a pump especially adapted to use as a fuel pump in airplanes. A further object of my invention is to provide improved fluid pressure balancing means for a fuel pump of the type in which the adjustable liner is pivoted at one side of the rotor and is movable between end plates disposed at opposite ends of the liner by means located at another side of the rotor. Another object is to provide such improved balancing means including improved inlet and outlet port arrangements through the liner and end plates, whereby to provide fluid communication with opposite sides of the rotor through inlets and outlets in the pump housing chamber. A still further object is to provide such fluid passages including communicating ports in the liner and end plates whereby it is made possible to maintain the movable liner balanced against both inlet and outlet pressures in all positions of the liner relative to its pivot. These and other objects and advantages of my improved construction will, however, hereinafter more fully appear.

In the accompanying drawings, I have shown for purposes of illustration one embodiment which my invention may assume in practice.

In the drawings:

Figure 1 is a side elevation of a fuel pump of my improved construction;

Fig. 2 is an end view of the pump;

Fig. 3 is a top plan view of the same;

Fig. 4 is a vertical section on line 4—4 of Figure 1;

Fig. 5 is a transverse section on line 5—5 of Figure 4, and

Fig. 6 is a sectional detail of the by-pass valve on line 6—6 of Figure 2.

In this illustrative construction, I have shown my improved pump as comprising a main pump housing 1 having a pump chamber 2 therein housing an improved pivoted liner 3 which encloses a pump rotor 4 and is adjustable in said chamber through a side of the housing 1 in response to variations in pressure acting on an actuating diaphragm 5. The rotor 4 is adapted to pump fuel supplied through a central lateral inlet 6 to an oppositely disposed outlet 7 and has a drive 8 projecting through one end of the housing 1 and adapted to be driven from any suitable rotating member of the engine. Improved end plates 9 and 10 are provided within the chamber at opposite ends of the rotor which

cooperate with the latter and with improved passages in the liner and housing 1 to provide improved fluid pressure balancing connections to the liner, hereinafter more completely set forth.

The main pump housing 1 preferably comprises a central casting 11 which houses the adjustable liner and rotor and which includes the inlet and outlet passages 6 and 7 communicating therewith, and opposite end castings 12 and 13 which have aligned recesses 14 and 15 adapted to receive the end plates 9 and 10, and which form the end closures for the pump chamber 2 in housing 1. The end casting 13 has a recess 16 aligned with a similar recess 17 in the opposite side of the casting 11 which receives the opposite ends of a pin 18 comprising a pivotal support for the liner 3 adjacent the inlet 6. The central casting 11 is further provided with an upper chamber housing the diaphragm 5 and comprising a chamber forming portion 19 integral with the casting 11 and a cooperating chamber forming cover 20 suitably secured thereto by means of bolts 21 peripherally arranged around the cover and clamping the diaphragm 5 between the casing portion 19 and the cover 20.

The diaphragm 5 is operatively connected with the liner 3 by means of a link 22 which is secured to the diaphragm in a well known manner and pivotally connected at 23 to a link 24 likewise pivoted at 25 to one side of the liner 3, as shown in Figure 4. A compression spring 27 is provided in a central passage 27a in the cover 20 above the diaphragm 5. One end of spring 27 bears against the upper of the central clamping discs for diaphragm 5 and the other end bears against a usual adjustable abutment 28 which is screw threaded on a stud 29 held in place by a threaded cap 30 threaded to the cover 20. Here it will be noted that the abutment member 28 is held against rotation in the passage 27a by splines 31 which enter into notches in the periphery of the abutment member. A pipe connection 32 is provided in the cover 20 for connecting the portion of the chamber above the diaphragm 5 to a supercharger, not shown, on the entrance side of the carburetor so that the pressure in the chamber above the diaphragm is the same as the pressure at the entrance of the carburetor.

Also, it will be understood that the portion of the chamber below the diaphragm 5 communicates with the pressure side of the pump and is always under pressure. Herein, said chamber communicates with the discharge side of the pump at the outlet 7 through communicating passages 33, 34 and 35 in the central casting

11. Similar passages 36, 37 and 38 are provided by which this chamber can be connected to the opposite side of the rotor at the inlet 6 in case it is desired to operate the pump in the reverse direction of rotation, suitable interchangeable plugs 39 and 40 being provided in the casting 11 which cooperate with passages 34 and 37. Herein, the plug 39 does not close off communicating passages 33, 34 and 35 while plug 40 is provided with a closure portion 41 which closes off the passage 37. However, it will be understood that these plugs are interchanged in the passages 34 and 37 if the rotation of the pump is reversed.

Referring more particularly to the adjustable liner 3 and rotor 4, it will be noted that the rotor comprises a usual cylindrical member 42 having reduced end portions 43, 44 at its opposite ends which are journaled in the opposite end plates 9 and 10; the usual rotor vanes 45 being radially supported therein with their inner ends abutting the central floating roller member 46, and their outer ends engaging the lining sleeve 47 in the liner, and this sleeve being provided with lateral passages 48 and 49 which are aligned with the inlet and outlet passages 50 and 51 in the liner. The passage 50 in the liner 3 communicates at the center of the rotor with an arcuate slot 52. The curvature of this slot is struck about the pin 18 as a center, and this slot extends from end to end of the liner and communicates at its opposite ends with outlet passages 53 and 54 in end plates 9 and 10, respectively; this construction being such that, as the liner is moved about its pivot 18 by the diaphragm 5, the passages 53, 54 in the end plates will always be in communication with the arcuate slot 52 in the liner. As shown most clearly in Figure 5, the passages 53, 54 are aligned with one end of U-shaped passages 55 and 56 in the end castings 12 and 13, respectively, the other ends of which communicate with a passage 57 in the central casting 11 which is in communication with the outlet 7. It will also be understood that suitable means are provided for limiting the downward movement of the adjustable liner (Figure 4), this means herein comprising a tubular abutment 58 having a threaded connection to an adjusting screw 58a.

A reversible wobble valve 59 carried by the end casting 13, controls the manual supply of fuel between the passages 60 and 61, this valve being reversible in a well known manner, for passing fuel in either direction corresponding to reverse directions of operation of the pump.

In the operation of my improved construction, the changes in the demand for fuel are indicated by the position of the diaphragm 5 which, in turn, through the link 22, controls the position of the adjustable liner 3 relative to the fixed rotor 4. Thus, it will be evident that as the demand for fuel decreases, the liner 3 will move about its pivot 18 toward the center of the rotor 4 and in such manner that at zero fuel flow, the center of the liner is coincident with the center of the rotor, the output capacity of the pump thus being varied as the liner 3 is moved about its pivot. The movement of the liner 3 under the influence of diaphragm 5 is completely unaffected by fuel pressures either on the intake or output side of the pump. Thus, the reduced pressures at the inlet side of the rotor being free to act in the chamber 2 on all sides of the liner 3, are completely balanced and, accordingly, do not affect the accuracy of control of the liner by the diaphragm. Likewise, the output pressures of the pump acting on the liner 3 are balanced out by reason of the

opposed end passages 53, 54 in the end plates which communicate with opposite ends of the slot 52 in the liner.

As a result of this construction, the liner is perfectly balanced against both inlet and outlet pressures in all positions of adjustment thereof. It will also be evident that at the same time it is made possible to provide a simple construction requiring a minimum of difficult machining. These and other advantages of my improved construction will, however, be apparent to those skilled in the art.

While I have in this application specifically described one embodiment which my invention may assume in practice, it will be understood that this form of the same has been shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a fluid pump, a pump housing having a chamber therein, a rotor in said chamber, a liner of greater diameter than and surrounding said rotor and spaced from the side walls of said chamber, said rotor having slots therein and vanes sliding in said slots and engaging the inner periphery of said liner, means for adjusting said liner relative to said rotor from the exterior of said chamber, and inlet and outlet passages in said housing having fluid communication with opposite sides of said rotor, one of said passages communicating with the interior of said liner at one side of said rotor and also communicating with the space between said liner and the walls of said chamber around the periphery of said liner, and the other passage communicating with the interior of said liner through oppositely disposed passages formed in said pump housing and in said liner at opposite ends of said liner.

2. In a fluid pump, a pump housing having a chamber therein, a rotor in said housing having vanes, a liner of greater diameter than and enclosing said rotor and spaced from the side walls of said chamber and pivoted in said chamber at one side of said rotor, means for adjusting said liner about its pivot from the exterior of said housing, said housing having fluid passage means formed in its opposite ends at one side of said rotor, and also having formed therein side fluid passage means disposed on the opposite side of said rotor from said end passage means, and said liner having passage means formed in its opposite ends and said liner also having formed therein side passage means, said end and side passage means in said liner communicating respectively with the end and side passage means in said housing and also communicating respectively with the space between said rotor and said liner at opposite sides of said rotor.

3. In a fluid pump, a pump housing having a chamber therein, end plates in said chamber, a rotor journaled at its opposite ends in said plates having vanes rotatable therewith and also having a driving connection extending through one of said plates to the exterior of said housing, a liner of greater diameter than said rotor in said chamber between said end plates enclosing said vanes, said liner being spaced from the side walls of said chamber and adjustable in said chamber about a pivot at one side of said rotor, means for adjusting said liner relative to said rotor including an operative connection extending into said chamber at another side of said rotor, and com-

communicating inlet and outlet passage means in said housing and liner communicating with opposite sides of said rotor, one of said passage means also communicating with the space between said liner and the walls of said chamber around the periphery of said liner, and the other passage means including aligned passages formed in said end plates and in said liner communicating with the interior of said liner.

4. In a fluid pump, a pump housing having a chamber therein, a rotor having vanes, a liner of greater diameter than said rotor enclosing said rotor and spaced from the side walls of said chamber and pivoted in said chamber at one side of said rotor, means for adjusting said liner about its pivot from the exterior of said housing, said housing having fluid passage means formed in the opposite ends of said chamber at one side of said rotor and also having side fluid passage means formed in the side of said chamber on the opposite side of the rotor from said end passage means, said side passage means communicating with the space between said liner and the walls of said chamber around the periphery of said liner, and said liner having passage means formed in its opposite ends communicating with said passage means in the opposite ends of said chamber in all angular positions of said liner and also having side passage means communicating with said side passage means in said housing, said end and said side passage means in said liner also communicating respectively with the space between said rotor and said liner at opposite sides of said rotor.

5. In a fluid pump, a pump housing having a chamber therein, a rotor having vanes, a liner of greater diameter than said rotor enclosing said rotor and spaced from the walls of said chamber and pivoted in said chamber at one side of said rotor, means for adjusting said liner about its pivot from the exterior of said housing, said hous-

ing having fluid passage means in the opposite ends of said chamber at one side of said rotor and side fluid passage means disposed on the opposite side of said rotor from said end passage means, and said liner having arcuate passage means in its opposite ends communicating with said passage means in the opposite ends of said chamber and with the space between said liner and said rotor and also having passage means communicating with the side passage means in said housing and also with said chamber around the periphery of said liner, said arcuate passage means being struck substantially about the pivot of said liner and said pivot being disposed on the side of said chamber remote from said arcuate passage means.

6. In a fluid pump, a pump housing having a chamber therein, end plates in said chamber, a rotor journaled at its opposite ends in said plates having vanes rotatable therewith and also having a driving connection extending through one of said plates to the exterior of said housing, a liner of greater diameter than said rotor in said chamber between said end plates enclosing said vanes and adjustable about a pivot at one side of said rotor, said liner being spaced from the side walls of said chamber, means for adjusting said liner relative to said rotor including an operative connection extending into said chamber at another side of said rotor, and communicating inlet and outlet passage means in said housing and liner communicating with opposite sides of said rotor, one of said passage means also communicating with the space between said liner and the walls of said chamber around the periphery of said liner, and the other passage means including aligned passages in said end plates and arcuate passages in the ends of said liner communicating with said aligned passages and with the interior of said liner.

MILTON E. CHANDLER.