

Oct. 6, 1942.

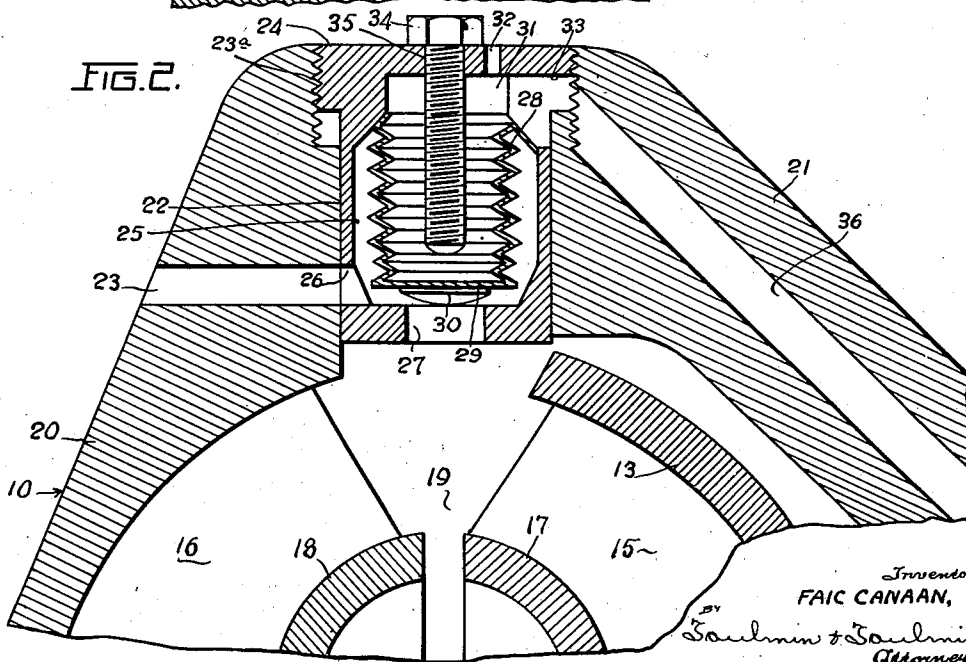
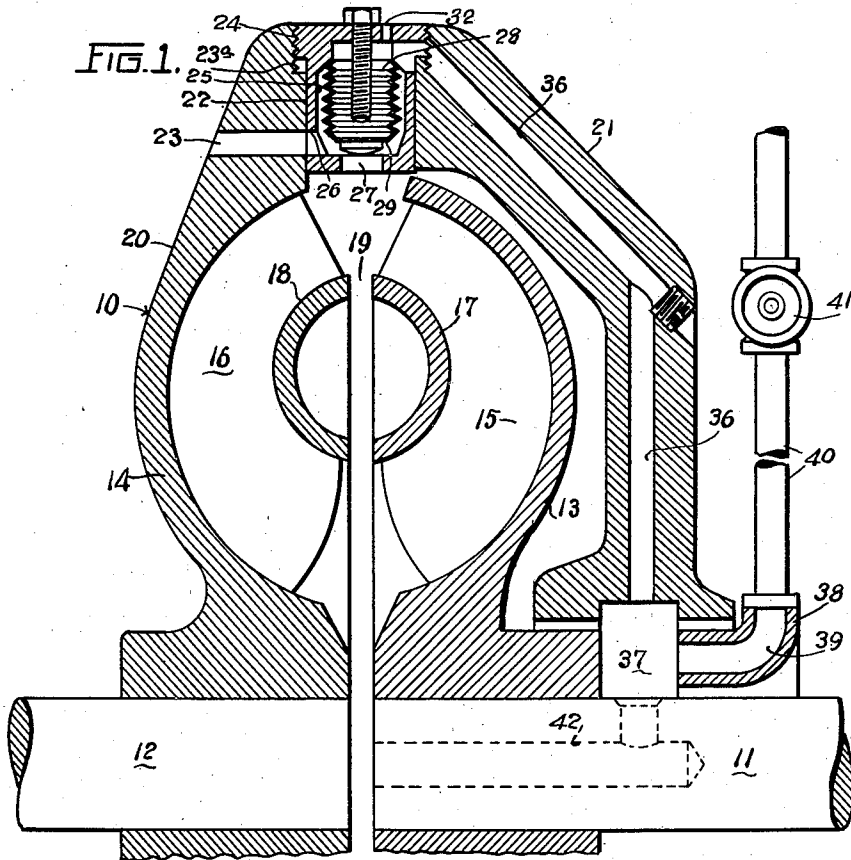
F. CANAAN

2,298,105

CONTROL DEVICE FOR FLUID POWER TRANSMITTERS

Filed Jan. 16, 1940

2 Sheets-Sheet 1



Inventor
FAIC CANAAN,
By
Gaulin & Gaulin
Attorneys

Oct. 6, 1942.

F. CANAAN

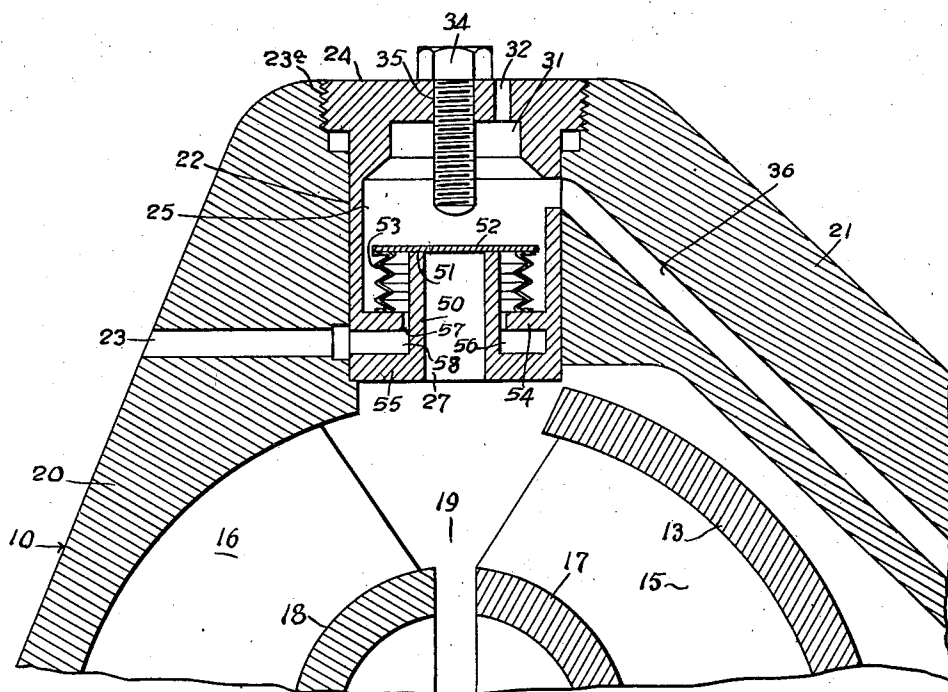
2,298,105

CONTROL DEVICE FOR FLUID POWER TRANSMITTERS

Filed Jan. 16, 1940

2 Sheets-Sheet 2

FIG. 3



Inventor
FAIC CANAAN.

BY
Soulmin & Soulmin
Attorneys

UNITED STATES PATENT OFFICE

2,298,105

CONTROL DEVICE FOR FLUID POWER TRANSMITTERS

Faic Canaan, Heidenheim-on-the-Brenz,
GermanyApplication January 16, 1940, Serial No. 314,037
In Germany November 1, 1935

6 Claims. (Cl. 60—54)

This invention relates to hydraulic power transmitters and in particular to control devices for emptying the working circuits of such transmitters.

One object of this invention is to provide a fluid power transmitter wherein the filling and emptying of the working chamber is controllable at will by the operator, the emptying being carried out at a rapid speed.

Another object is to provide a fluid power transmitter, such as a hydraulic coupling, wherein peripheral discharge ports are closed by thin plates carried by an expansible bellows.

Another object is to provide a fluid power transmitter as set forth in the preceding object, wherein the interior of the bellows is in communication with the filling conduit for the transmitter.

Another object is to provide a fluid power transmitter having peripheral emptying ports closed by thin plates mounted on expansible bellows, the interior of each bellows being in communication with the exterior of the transmitter, such as the atmosphere.

Another object is to provide a fluid power transmitter having peripheral emptying ports closed by thin plates mounted on elastic or expansible bellows, one side of the plates being in communication with the filling conduit for the working chamber and also connected with the exterior of the coupling by a port which is smaller in cross section than the cross section of the fluid supply conduit leading to the chamber in which the plates and bellows are mounted.

This application is a continuation in part of my copending application, Serial No. 107,741, filed October 26, 1936, now Patent No. 2,186,956.

In the drawings:

Figure 1 is a longitudinal section through a part of a fluid power transmitter equipped with the peripheral emptying ports and bellows-operated plate valve members of this invention.

Figure 2 is an enlarged view of the upper portion of Figure 1 containing the bellows-operated valve.

Figure 3 is a view similar to Figure 2 but showing a modification wherein the interior of the bellows stands in communication with the exterior of the transmitter, such as with the atmosphere.

In general, the fluid power transmitter of this invention consists of a casing having a plurality of rotors and containing a plurality of peripheral emptying ports. These emptying ports are closed by small discs or plates mounted on an expansi-

ble member consisting of an elastic bellows. By expanding and contracting this bellows the emptying ports can be opened or closed at the will of the operator. In one form of the invention the interior of the bellows is connected to the filling conduit for the working chamber so as to be expanded when the chamber is filled, thereby closing the emptying ports. In a modification of the invention (Figure 3) the interior of the bellows stands in communication with the exterior of the transmitter, such as with the atmosphere.

Hitherto with previously known fluid power transmitters, such as hydraulic couplings, the emptying of the working chamber has been effected by peripheral ports which are constantly open so that the leakage loss occurring during running is counteracted by means of a filling pump. To empty the working chamber, the filling pump is merely halted whereupon the fluid in the working chamber escapes by centrifugal force through the peripheral ports. In other types of hydraulic power transmitters, relatively heavy valves, guided in suitable guides, have been used for controlling the emptying ports. The centrifugal force arising from the weight of these valves has required additional pressure to keep them shut, and these valves have been subject to seizure when their surfaces have been fouled by dirt or other foreign matter in the working fluid.

In the present invention, however, the valve elements consist of thin plates or discs which have only a trifling weight and hence are not seriously affected by centrifugal force. These disc or plate valves, moreover, do not require guide surfaces, hence seizure thereof is eliminated. The valve plates or discs are preferably of thin iron or other metal, leather, India rubber, or other flexible material and do not require the high-pressure of fluid necessary in previous arrangements for keeping the valves closed while the fluid power transmitter is full and running. Moreover, in the present invention the discs or plates are mounted upon expansible members such as elastic bellows, by the expansion and contraction of which the emptying ports are closed or opened. The cross sectional areas of these ports are also so large that a rapid discharge of the fluid is possible, and the over-all diameter of the fluid power transmitter may also be kept at a minimum.

Referring to the drawings in detail, Figures 1 and 2 show a fluid power transmitter, such as a hydraulic coupling, having shafts 11 and 12 car-

rying rotors 13 and 14 equipped with blades or vanes 15 and 16 bounded by core rings 17 and 18 respectively. Between the rotors 13 and 14 is located the working chamber 19 of the transmitter. The outer wall 20 of the rotor 14 and its extension 21 form a casing or housing enclosing the rotors and surrounding the working chamber 19.

In order to provide for emptying the working chamber 19 of the working fluid, the casing 20 is provided with radial bores 22 having transverse ports 23 leading therefrom to the exterior of the coupling. The bores 22 are provided with threaded counterbores 23a for receiving the correspondingly threaded portions of tubular valve casings 24 containing internal chambers 25 communicating by the ports 26 with the ports 23. The casings 24 also contain the emptying ports 27 interconnecting the working chamber 19 with the valve casing chamber 25.

Mounted in the valve casing chamber 25 (Figure 2) is an expansible bellows 28 having a plate-like end 29 carrying the disc-shaped valve member 30.

The bellows 28 is secured at its upper or open end to the casing 24 and opens into the outer chamber 31. Leading from the outer chamber 31 is a leakage port 32 of relatively smaller diameter of cross section than the entrance port or inlet port 33 by which pressure fluid is admitted to the interior of the bellows 28. The motion of the end 29 of the bellows 28 is limited by the cap screw 34 threaded through the bore 35 in the valve casing 24.

The inlet port 33 communicates with an inlet passageway 36 leading through the casing portion 21 to a chamber 37 surrounding the shaft 11. The chamber 37 is in communication with the filling member 38 having the filling passageway 39 connected to the filling conduit 40. The latter is connected to a filling pump (not shown) and is provided with a valve 41 which may be opened or closed to control the filling of the fluid power transmitter. The working chamber 19 of the latter is filled from the chamber 37 by a shaft passageway 42 leading therefrom through the shaft 11 to its end.

In the operation of the fluid power transmitter shown in Figures 1 and 2, the filling pump is started in operation and the valve 41 opened so that liquid flows through the conduit 40, passageway 39, chamber 37 and shaft bore 42 into the working chamber 19, filling the latter to the desired point. At the same time, pressure fluid flows through the passageway 36 into the interior of the expansible bellows 28 and expands each bellows, causing its valve member 30 to tightly engage and close its adjacent port 27. A small amount of the liquid escapes through the small port 32 during running but is constantly renewed by the filling pump so that the valve members 30 remain in their closed positions.

When it is desired to halt the fluid power transmitter, the filling pump is halted or the valve 41 is closed so that liquid is no longer supplied to the interior of each bellows 28. Under these circumstances the centrifugal force of the liquid within the working chamber 19 forces each valve member 30 away from the port 27 and the liquid escapes through the port 27, the port 26 and the port 23 to the exterior of the transmitter. Any particles of dirt in the working fluid will ordinarily be swept away by the fluid itself and cannot interfere with the seating of the valve members 30 against the ports 27. A slight tem-

porary leak due to a dirt particle does not adversely affect the normal operation of the hydraulic power transmitter, since the small leakage losses are made good by the filling pump.

The emptying ports 27 in the valve casings 24 mounted in the bores 22 are ordinarily formed in the driving part of the fluid power transmitter, so that centrifugal force is always present for the emptying of the working chamber 19. Under these conditions, the shaft 12 and rotor 14 are the driving elements and the shaft 11 and rotor 13 the driven elements.

While the coupling or hydraulic power transmitter is being emptied through the emptying ports 27, the fluid within the bellows 28 and passageways 36 escapes through the leakage ports 32 to the exterior of the casing so that this part of the apparatus is also quickly emptied. The volumes of these control chambers and passages, 31 and 36, are kept as small as possible so that their total volume amounts to not more than five percent of that of the remainder of the circuit. In this manner, the rapid emptying of the circuit is made possible since the greater part of the liquid present in the interior of each bellows and the communicating chamber 31 and passageway 36 must escape through the small port 32 before the valve members 30 can open to their fullest extent, as governed by the cap screws 34. It will be understood that the leakage ports 32 are of smaller cross sections than the inlet ports or passageways 36, so that when the filling pump is operating and the coupling is being filled, pressure fluid will be supplied more rapidly to the interior of each bellows 28 than it can escape through the leakage port 32.

In the modification shown in Figure 3 the port 27 in each valve casing 24 is provided with an outwardly extending tubular portion 50 terminating in a valve seat 51. The latter is engaged by a thin disc-like valve member 52 attached to the bellows 53 at the outer end thereof. The inner end of each bellows 53 is secured to a flange 54 forming a part of the valve casing 24 and spaced away from the end wall 55 thereof to form the passageway 56 surrounding the tubular portion 50. The inner edge of the flange 54 is also spaced away from the outer surface of the tubular portion 50 so as to provide an annular passageway 57 leading from the interior of the expansible bellows 53 to the annular chamber 58. The latter communicates through the ports 58 with the ports 23 leading to the exterior of the apparatus.

In the operation of the modification shown in Figure 3, the opening of the valve 41 and the operation of the filling pump fills the outer chamber 31 of the valve casing 24 with pressure fluid, at the same time filling the working chamber 19. Since the interior of the bellows 53 is in communication with the atmosphere, it is quickly collapsed and the disc-like valve member 52 forced inwardly against the valve seat 51, closing the emptying ports 27. These ports 27 remain closed even under the action of centrifugal force upon the liquid within the working chamber 19 because of the greater area of the valve discs 52 on their outer sides than on their inner sides.

When it is desired to empty the working chamber 19, the valve 41 is closed or the filling pump halted as before. Pressure fluid then escapes from the valve operating chambers 31 through the leakage ports 32 and centrifugal force acting upon the liquid within the working chamber 19 forces the liquid outward against the valve plates

or discs 52, forcing them away from their seats 51 and permitting the liquid to escape through the interior of the bellows 53 and passageways 57 outward through the annular chambers 56, ports 58 and ports 23.

It will be understood that I desire to comprehend within my invention such modifications as come within the scope of the claims.

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

1. In a hydraulic power transmitter, a working chamber, a driving rotor and a driven rotor therein, an emptying port leading out of said working chamber, a thin valve plate or lamina closely engageable with said emptying port, a control chamber, a bellows communicating with said control chamber and supporting said valve plate or lamina, and means for supplying pressure fluid to said control chamber to move said bellows and closely engage said valve plate or lamina with said emptying port.

2. In a hydraulic power transmitter, a working chamber, a driving rotor and a driven rotor therein, an emptying port leading out of said working chamber, a valve member in form of a relatively thin flexible plate closely engageable with said emptying port, a control chamber, a bellows communicating with said control chamber and connected to said valve member, and means for supplying pressure fluid to said control chamber to move said bellows for closely engaging said valve member with said emptying port, the area of the valve member surface acted upon by the pressure fluid within said control chamber being greater than the valve member surface acted upon by the pressure fluid at said emptying port.

3. In a hydraulic power transmitter, a working chamber, a driving rotor and a driven rotor therein, an emptying port leading out of said working chamber, a sealing lamina closely engageable with said emptying port, a control chamber, a bellows communicating with said control chamber and supporting said sealing lamina, and means for supplying pressure fluid to said control chamber to move said bellows and closely engage said valve member with said emptying port, the interior of said bellows opening into

said control chamber, said bellows being expandable to press said lamina against said emptying port in response to the admission of pressure fluid to said control chamber.

4. In a hydraulic power transmitter, a working chamber, a driving rotor and a driven rotor therein, an emptying port leading out of said working chamber, a control chamber, a bellows having its exterior communicating with said control chamber, a valve member in form of a relatively thin plate mounted on said bellows and closely engageable with said emptying port, and means for supplying pressure fluid to said control chamber to contract said bellows and press said valve member against said emptying port.

5. In a hydraulic power transmitter, a working chamber, a driving rotor and a driven rotor therein, an emptying passageway leading out of said working chamber, a control chamber, a bellows having its exterior communicating with said control chamber and having its interior in continuous hydraulic communication with an exhaust, a lamina mounted on said bellows and separating said control chamber from said passageway, said lamina being movable selectively into a first position to directly connect said passageway with said exhaust through said bellows, or into a second position for interrupting hydraulic communication between said passageway and the interior of said bellows, and means for supplying pressure fluid to said control chamber to move said lamina into said second position.

6. In a hydraulic power transmitter, a working chamber, a driving rotor and a driven rotor therein, an emptying port leading out of said working chamber, a control chamber, a bellows supported by said driving rotor and having its exterior communicating with said control chamber, a valve member mounted on said bellows and closely engageable with said emptying port, and means for supplying pressure fluid to said control chamber to contract said bellows and close said valve member against said emptying port, said valve member comprising a relatively thin flexible plate mounted upon said bellows.

FAIC CANAAN.