Feb. 20, 1945. A. E. BAAK 2,369,707

PRESSURE TRANSFER DEVICE

Filed April 6, 1942 2 Sheets-Sheet 1

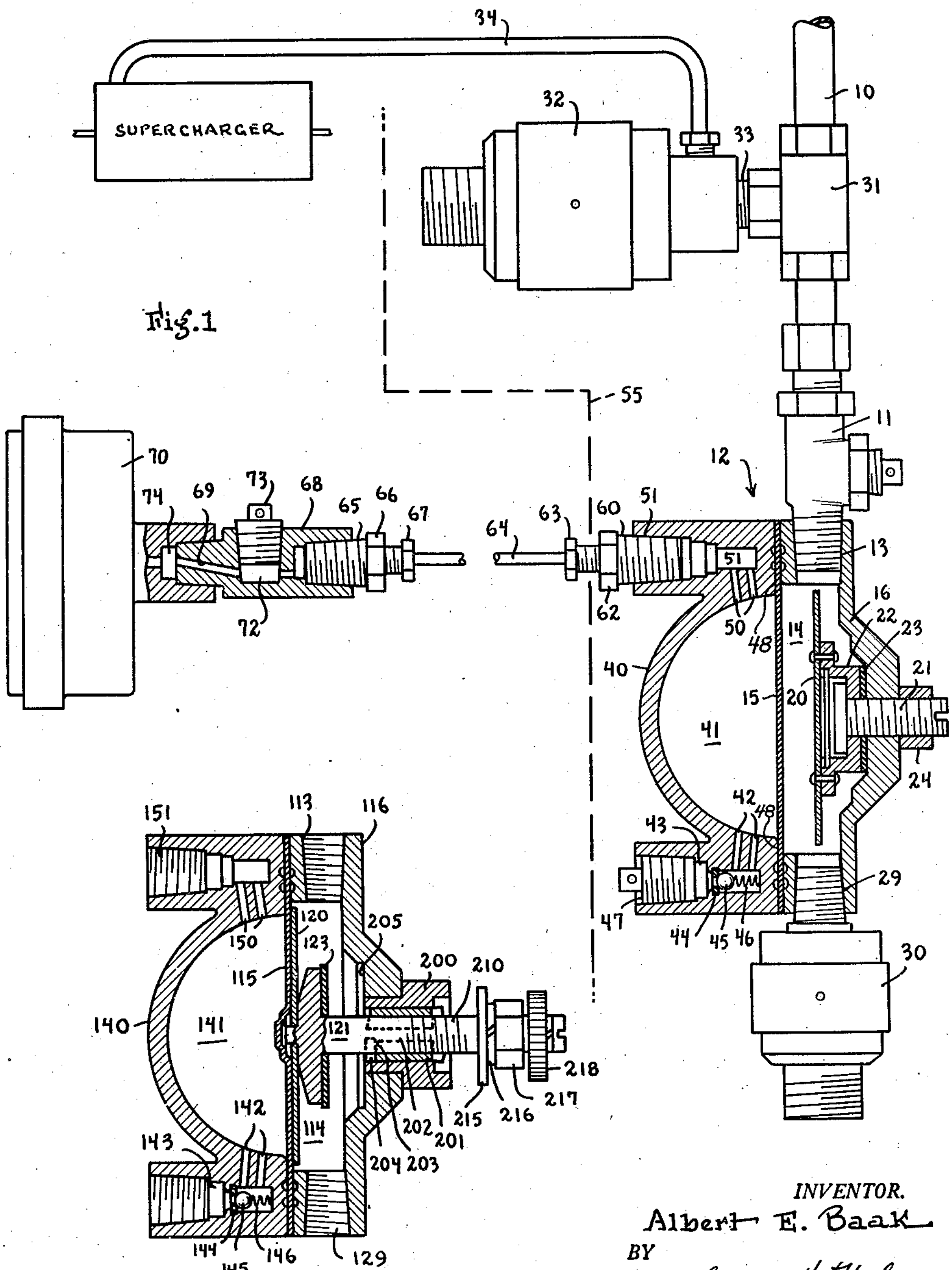

Fig.1

Fig.3

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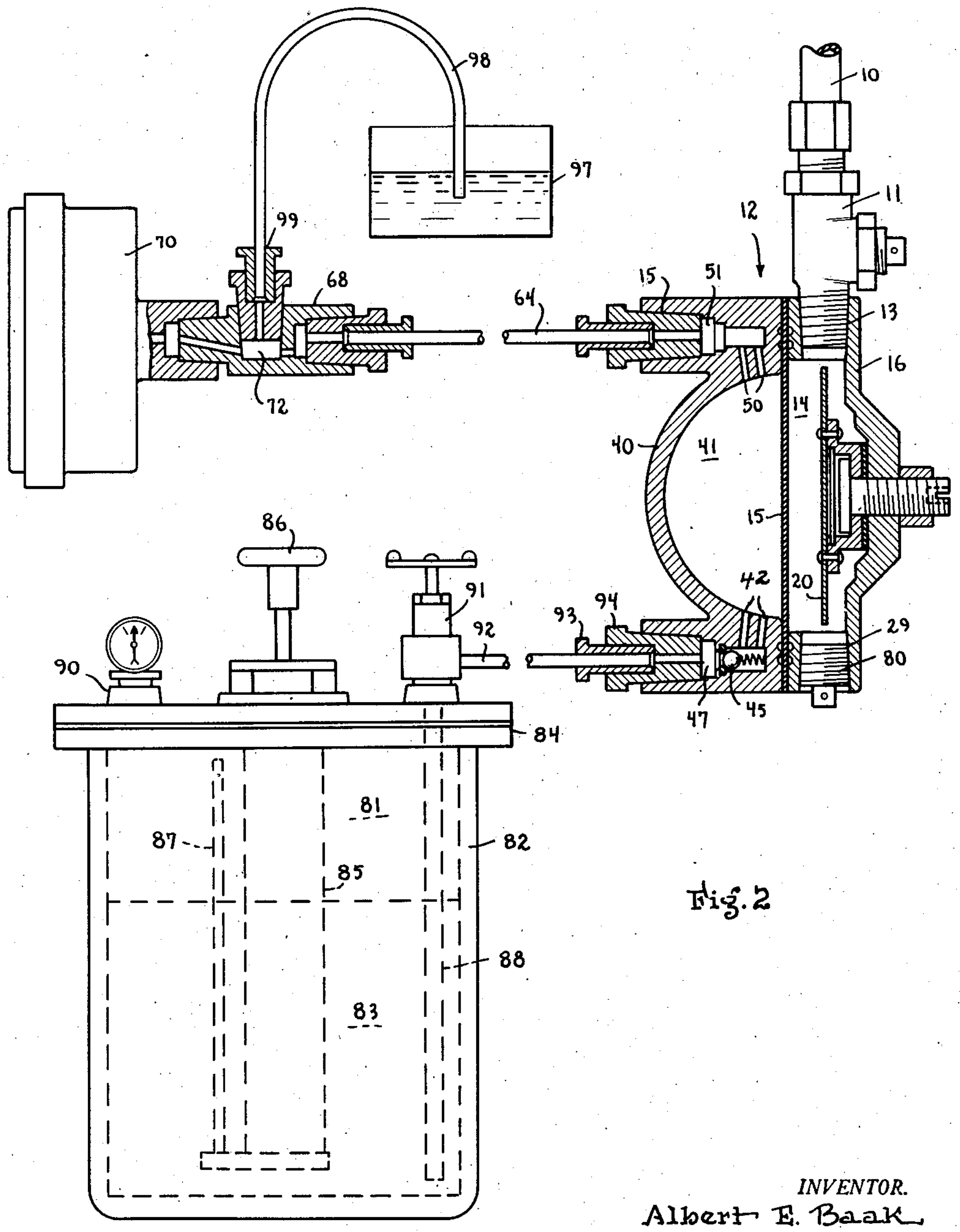

Fig. 2

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UNITED STATES PATENT OFFICE

2,369,707

PRESSURE TRANSFER DEVICE

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Application April 6, 1942, Serial No. 437,862

10 Claims. (Cl. 73—395)

This invention relates to a remote pressure transmission system that provides for the increased accuracy and sensitivity in operation by fluid means of various types of aircraft indicating and control devices. In particular, the system of my invention relates to the operation of such instruments from a capillary fluid line that may be of considerable length, and in which the fluid is substantially unaffected by wide variations of pressure and temperature to which it may be subjected, in cooperation with my novel fluid pressure transmission cell. The pressure transfer cell of my invention serves as a combination condition responsive device and hydraulic motor means for controlling the instrument actuating fluid.

Prior to my invention the widespread practice for the operation of gasoline and oil pressure instruments located in the control rooms of aircraft was by direct connection of the instruments with the gasoline and oil lines. The gasoline and oil lines were of relatively small diameter with the fluid therein subject to more or less variation in viscosity and other characteristics when subjected to wide changes in temperature and pressure conditions of the line. It is apparent that by this system it was necessary to run lines conveying inflammable gasoline and oil or other fluids to the control room and thus create a potential fire hazard, and also that frequent checking and cleaning of the instruments and lines was necessarily required, due to their not forming a hydraulic system closed against entry of extraneous matter.

It is an object of my invention to provide a safety system in which my novel pressure transfer cell is employed as a condition responsive device in close association with a relatively short gasoline or oil fluid pressure line of relatively large diameter. This is advantageous because gasoline, oil or other fluid in a line of relatively short length is not substantially affected by external temperature conditions and also because the line may be of such relatively large diameter as to require little if any cleaning in order to insure proper operation of the system. The cell of my invention cooperates with a line containing a separate instrument actuating fluid and provides for the automatic compensation of the system for external variations in temperature, for separating the instrument actuating fluid from the inflammable gasoline and oil, and also for transmitting pressure of the gasoline, oil, or other fluid to the actuating fluid for the operation of the instrument.

Another object of my invention is to provide a novel pressure transfer cell employing a diaphragm therein for the direct transmission of gasoline, oil or other fluid pressure from the diaphragm through an extremely sensitive fluid which I enclose in a capillary hydraulic line to afford rapid, accurate and sensitive operation of an instrument, since the capillary line may be of considerable length and exposed to widely varying external conditions.

It is another object of my invention to provide important safety features in the operation of aircraft gage and control devices by making possible their separation from and, if desired, remote location with respect to lines conveying the gasoline, oil or other inflammable fluid. In accordance with my invention the pressure transfer cell together with the gasoline or oil line are located in one zone and separated by a fire resistant wall from the gage or control devices which are located in a second zone. A further safety feature of the system of my invention is the provision of a diaphragm means in the pressure transfer cell for preventing the entrance of the gasoline, oil, or other fluid to the hydraulic operating line and to the gage and control devices operated thereby even upon failure of operation of the hydraulic line or of the devices. For example, the hydraulic line as employed with aircraft may be of the considerable length required to extend from the engine through a zone associated with a portion of the wing in which the engine may be located and to devices located on a panel in the control room. The devices and the hydraulic line in particular may be subjected to widely varying vibration and temperature conditions. However, upon breakage or failure of the hydraulic line or devices my system, unlike previous systems in widespread use, will operate to prevent the gasoline, oil, or other fluid to which the pressure transfer cell responds from escaping to create a potential fire hazard in various parts of the aircraft.

A further object of my invention is the provision of a new and novel pressure transfer cell unit. The cell unit provides for two fluid chambers separated by a diaphragm and to a first of the two chambers a relatively large line may be connected for the admission thereto of a fluid of variable pressure. This fluid may consist of gasoline or oil which directly actuates the diaphragm in accordance with variation in the pressure of the fluid; or an intermediary fluid may be employed which may be varied in response to temperature or other conditions. The cell unit is employed as a motor for the hydraulic transmission of pressure variations in the first chamber to a fluid in the second chamber thereof. The second chamber has both means for initially admitting a fluid thereto and means affording a connection between the cell and the line or reservoir for the normal operation of the instrument or instruments connected to the line or reservoir. The volume of the fluid in the second chamber and the size of the diaphragm are such as to automatically compensate for external changes in temperature and pressure throughout the system. In the operation of the system of my invention, the actuating fluid in the second chamber and in the line associated therewith is preferably adjusted initially to a pressure value of one atmosphere.

A still further object of the invention is to provide means in the pressure transfer cell to restrict and limit any rapid and large surges in the flow of the fluid when the system is in actual operation. The prevention of large and rapid surges in fluid flow serves, for example, to prevent injury to the diaphragm should a leak or break in the system occur which might otherwise result in the application of a suddenly applied force of a magnitude sufficient to injure the diaphragm.

One object of my invention is the provision of a system in which fluid operated instruments, including gages and control devices, may be accurately and rapidly actuated in response to remotely located condition responsive means and in which the interval between inspections of the system required for checking, overhauling, cleaning and refilling of the elements is greatly lengthened. A further object of my invention is the provision of a method for the rapid, accurate and advantageous checking, cleaning and refilling of a hydraulic system, compared to the methods required in connection with other known systems.

A particular object of my invention is the provision of a method for rapidly checking, cleaning and refilling the line and transfer cell elements of my system by making possible the introduction of the hydraulic fluid to the pressure transfer cell under high pressure for distribution throughout the system and by providing for the draining of the fluid at high pressures from the system until the flow of draining fluid is free of entrapped air to thus indicate that the remaining fluid is in condition for the proper operation of the system, when the supply of fluid under pressure may be discontinued, permitting the fluid in the system to attain atmospheric pressure conditions.

A more detailed object of my invention is the provision in one chamber of my pressure transfer cell unit of a diaphragm backing plate which is movable therein and employed to support the diaphragm without deflection by fluid pressure when the hydraulic fluid is initially introduced to the cell and system under relatively high pressures, the other chamber being unaffected, and also to ensure that the proper quantity of air free fluid is retained in the system for the proper operation of the instruments upon completing the cleaning and filling operation for the cell and system.

Further objects and advantages of the invention will appear from the following detailed description and from the illustrations of one embodiment thereof in which:

Figure 1 is a diagrammatic view partly in section of my system as employed in normal operation;

Figure 2 is a diagrammatic view partly in section of my system during a portion of the checking and filling operations, and

Figure 3 is a diagrammatic view partly in section of a modification of the pressure transfer cell unit employed in my system.

The system is first described below when assembled for normal operation as illustrated in Figure 1. The engine fuel, or oil line, **10** is threadedly connected to a manually operated valve member **11** and this member is threadedly attached to the pressure transfer cell unit generally indicated at **12** by a direct connection **13** with the fluid pressure chamber **14**. The pressure chamber **14** is defined by a diaphragm **15** and the pressure transfer cell casing member **16**.

A diaphragm backing plate member **20** is supported for movement in the chamber **14**. A locking screw member **21** is supported in the housing **16** and the head portion is secured in a flanged recess formed in the follower member **22** upon which is supported the diaphragm backing plate **20**. A gasket **23** is mounted on the screw member **21** and secured to the flanged follower member **22**. In the normal operation of the system the diaphragm backing plate **20** is in the diaphragm non-supporting position to which it is locked by the screw member **21** and the lock nut **24**. The diaphragm backing member **20** is employed in a manner which is described below.

A threaded passageway **29** is provided in the lower portion of the cell casing member **16** and this passageway is adapted to receive a fluid pressure actuated switch **30**. Also, the fluid pressure line **10** is adapted to have connected therein a T-shaped coupling member **31** for connecting the line **10** with a fluid differential pressure actuated switch **32**. The differential pressure switch **32** is threadedly connected to the fluid line at **33** and also to a supercharger or other source of fluid pressure by a threaded connection with the line **34**. The fluid pressure actuated switches may be employed to control separate signal and control devices and are preferably of the type disclosed in my copending application Serial No. 437,863, filed April 6, 1942. However, in the event that it is not desired to employ pressure switches **30** and **32**, these members may be omitted and plug members may be substituted therefor in the transfer cell and in the line.

The cell diaphragm **15** and the cell casing member **40** defines a second chamber **41**. Chamber **14** is somewhat larger than chamber **41** where they respectively contact diaphragm **15**, so that a ledge **48** is formed by a portion of the wall of chamber **41**. On actuation of locking screw **21** the backing plate **20** seats firmly against and is aligned with the ledge **48** through diaphragm **15**, and accordingly diaphragm **15** has an unyielding support over its whole area. The casing member **40** has a series of passages **42** formed therein to provide for communication between a threaded passage member **43** formed in the casing member **40** and the cell chamber **41**. A check valve consisting of an orifice plate and valve seat member **44**, a ball valve member **45**, and a spring valve biasing member **46** is contained in the passageway **43**. The check valve serves to permit a flow of fluid through the passage **43** to the chamber **41** and to prevent the escape of fluid therefrom, as hereinafter set forth, but in the normal operation of the system a threaded plug member **47** is mounted in the passageway

43. A series of orifices 50 are formed in the casing 40 and these orifices provide for communication between the threaded casing passageway 51 and the chamber 41.

The pressure transfer cell unit is closely associated with the aircraft engine or other fluid source to which the line 10 extends and this line 10 is of preferably short length and relatively large diameter. The pressure transfer cell may be mounted in any obvious manner. However, I have indicated in dotted lines a fire wall 55 of the engine compartment and this is employed to separate the pressure transfer cell and the source of fluid pressure for the actuation of the cell from the remaining portion of the system. The pressure transfer cell is preferably mounted upon the fire wall 55. A threaded plug member 60 and the associated members 62 and 63 are employed for connecting a capillary line 64 through the fire wall 55 and with the threaded passageway 51 of the pressure transfer cell.

The capillary line 64 may be of considerable length, such for example as required to extend from wing mounted aircraft motors and through the wings of the aircraft to the control cabin for cooperation with a panel mounted indicating or control instrument 70. The line 64 is connected at one end by a plug 65 having the mounting members 66 and 67 associated therewith to a main plug member 68 for cooperation with a passageway 69 extending therethrough. The main plug member 68 has associated therewith a second threaded passageway 72 which also communicates with the passageway 69 and a branch plug member 73 is mounted in this threaded branch passageway. The main plug 68 is associated directly with the instrument 70 and the plug passageway 69 cooperates with a passageway 74 in the instrument.

A fluid is employed in the chamber 41 of the pressure transfer cell and in the capillary line 64 for the operation of the instrument 70 which will accurately and rapidly actuate the instrument in accordance with the varying pressure transmitted by diaphragm 15 of the pressure transfer cell. This fluid is preferably of a type that is substantially unaffected by the relatively great external variations in temperature to which the elements of my system may be subjected, that is non-inflammable, that will not corrode the line and that will not cause clogging of the system throughout the wide range of temperature to which it is subjected. Fluids having desired operating characteristics and which I prefer for use in my system are "Stanisol" or "Stoddard Solvent."

In the operation of my system the pressure from the fluid fuel or oil admitted to the chamber 14 of the pressure transfer cell is transmitted by the diaphragm 15 which is of relatively thin and highly elastic material to the hydraulic fluid in the chamber 41 and the capillary line 64 for the sensitive and accurate operation of the instrument 70. The orifices 50 of the pressure transfer cell are sufficiently numerous to cause no appreciable effect on the normal flow of fluid between the pressure transfer cell and the capillary line 64. Should a failure occur in the operation of my system of a type which, for example, might involve a leak or break in the capillary line the hydraulic fluid would be permitted to escape from the chamber 41 of the pressure transfer cell. The orifices 50, however, serve to prevent the escape of fluid in a rapid and large surging movement that might damage the diaphragm. The elastic diaphragm is of sufficient size and strength to continue in operation for the purpose of preventing the ignitable gasoline, oil or other fluid from gaining access to the chamber 41 and the associated portions of the system.

The novel method of cleaning, checking and filling the elements of my system is illustrated in Figure 2 and similar reference characters have been applied to parts of the system corresponding to similar parts employed in the normal operation thereof as illustrated in Figure 1. Also, in Figure 2, the switch devices 30 and 32 have been omitted from the system and a plug member 80 inserted in the pressure transfer cell passageway 29 has been substituted for the switch 30.

In filling the system with the hydraulic fluid I employ a manually operated air pump and fluid reservoir member 81. The member 81 consists of a chamber 82 containing fluid 83 and a cover member 84. The manually operated pump consists of the cylinder 85 containing the plunger which is operated by the rod and handle 86. The cylinder has a pipe extension member 87 for admitting air pressure from the pump to the upper surface of the fluid in the reservoir 82. Upon operation of the pump a pressure is accordingly exerted upon the upper surface of the fluid and this serves to force the fluid through the outlet pipe 88 which extends to the lower portion of the reservoir. A gage member 90 is provided on the cover member 84 for indicating the pressure applied to the fluid and a hand operated valve 91 is associated with the fluid outlet pipe 88 to control the flow therefrom. The valve member is connected by a tube 92 and the associated members 93 and 94 to the passageway 47 of the pressure transfer cell.

A fluid drain container 97 and a drain pipe 98 are associated with a plug 99 and this plug is inserted in the main plug 68 for connection with the passageway 72, being substituted for the branch plug 73 illustrated in Figure 1 of the drawings.

In Figure 2 I have illustrated the system as it is being prepared for the draining, cleaning and filling operations. The diaphragm backing plate member is illustrated in the non diaphragm supporting position. However, at this time this plate is threadedly operated to a position in which it supports the diaphragm 15 against movement by the fluid and in a neutral position. In cleaning and filling the system the pump 85 is operated until a pressure of preferably between 25 and 50 pounds per square inch is exerted upon the surface of the fluid in the reservoir 82. The valve 91 is then adjusted to permit the fluid to flow from the outlet pipe 88 to the line 92 and the passageway 47 of the pressure transfer cell. The check valve 45 in the pressure transfer cell passageway permits this fluid to flow through the orifices 42 for admission to the cell chamber 41. The hydraulic fluid under pressure flows through the orifices 50 and the passageway 51 of the pressure transfer cell to the capillary line 64, and the main plug 68. The fluid under pressure is permitted to flow through the system and to drain therefrom by flowing through the plug member 99 and the line 98 to the fluid drain container 97. The flow of fluid under pressure insures that the various lines and passageways of the system are in a non-clogged and clean condition. The flow of fluid is permitted to continue until the fluid drained from the system is free of bubbles to thus indicate that the fluid in the system is free from the presence of air. When the system has been thus checked and filled, the manually operated valve 91 of the fluid reservoir is closed and the flow of fluid to the system is discontinued. The fluid is permitted to escape by continuing the draining operation until the pressure of the fluid remaining in the system has decreased to a desired value. The draining of the fluid in this manner is preferably continued until the pressure of the fluid in the system has decreased to the atmospheric pressure value. Following the filling of the system with fluid, for installation or for checking purposes, the system is connected for assembly as shown in Figure 1 to provide for normal operation.

Subsequent to performing the filling operation for the system, it is apparent that the diaphragm backing plate 20 is again withdrawn from the diaphragm and locked in a position having the gasket member 23 in engagement with the casing member 16 of the pressure transfer cell. This diaphragm backing plate 20 is employed to support the diaphragm in a non-deflected position not only when the system is being filled with the hydraulic fluid but also when it is desired to discontinue operation of the system, for example, upon disconnecting the pressure transfer cell from the fuel or other lines or when the valve 11 is turned to the closed position.

In Figure 3 I have illustrated a modification and preferred embodiment of my fluid pressure transfer cell unit. In this embodiment the pressure transfer cell unit consists of a first casing member 116 and a second casing member 140. The diaphragm 115 is supported between the casing members and the casing members are securely bolted or clamped together in any well known manner. The casing member 116 is so shaped that together with the diaphragm 115 it forms a chamber 114. Also, the casing member 140 is so shaped that together with the diaphragm 115 it forms the chamber 141. A threaded passageway 113 is formed in one end of the casing member 116 to provide for connecting the pressure transfer cell with the fluid fuel line or with a desired line containing fluid of variable fluid pressure. The threaded passageway 129 is also provided in the casing member 116 for the purpose of connecting either a fluid pressure actuated switch or a plug member thereto. The casing member 140 has formed therein a threaded passageway 151 and the orifices 150 which communicate with the passageway 151 and with the chamber 141. A threaded passageway 153 is also formed in the casing member 140 together with the orifices 142 extending between the passageway 143 and the chamber 141. The passageway 143 contains a check valve consisting of a valve seat 144, a ball valve 145 and a valve biasing spring 146.

It will be apparent that the above described parts of the preferred embodiment of my pressure transfer cell correspond to similar parts and function in a similar manner to the transfer cell illustrated and described in connection with Figures 1 and 2 of the drawings. A somewhat elastic and relatively thick diaphragm 115 of the cell unit is not supported in a relatively taut manner by the casing members but is of a size having a somewhat greater cross-sectional area than the maximum cross-section area of chambers 114 or 141. The cell unit of Figure 3 is illustrated with the backing plate member 120 locked in the position in which it supports the diaphragm 115 in a neutral position and serves to prevent deflection of the diaphragm as a result of variable pressures occurring in the chambers 114 and 141. In this position the end portion of the backing plate disc member 120 is supported against the cover member 140. The backing plate is accordingly illustrated in the position to which it would be locked for supporting the diaphragm during the time when the hydraulic fluid fill is being added to the system for checking and installation purposes.

The backing plate member 120 is supported upon a threaded plunger member 121 and a gasket member 123 is also secured to this plunger member. In my preferred embodiment, the plunger member contains means for readily and automatically locking the plunger member in both the diaphragm supporting position and in the diaphragm operating position. For this purpose a first sleeve plug member 200 is supported in the casing member 116. The sleeve member 200 in turn supports a second sleeve member 201 which has formed internally therein a double cam surface consisting of a slot 202 and a helical shaped end portion 203, as illustrated by the dotted lines. A pin member 204 mounted upon the plunger member 121 cooperates with the cam surfaces formed in the sleeve member 201 and as illustrated is in engagement with the cam end surface 203 for locking and retaining the plunger member in the position in which the backing plate 120 supports the diaphragm. The threaded plunger member 121 carries thereon a washer 215, a lock washer 216, a nut 217 and the manual operating knob 218 having knurled or milled edges.

To place the cell unit in readiness for operation the diaphragm backing plate member 120 is withdrawn from the diaphragm supporting position by rotating the plunger 121 to remove pin 204 from the helical end portion of the cam surface 203 followed by the outward movement of the plunger to withdraw the pin from the cam slot 202 for support on the outer end of the cam sleeve member 201. The head of the plunger 121 is thus positioned in the recess formed in casing member 116 and the gasket 123 is placed in firm contact with the gasket seating portion 205 of the casing 116. The washer 215 and the lock washer 216 together with the nut member 217 are then positioned on the threaded plunger to securely lock the washer 215 against the end surface of the plug and sleeve member 200.

It will be noted that in each of the modifications of the pressure transfer cell the positioning of the diaphragm is varied in accordance with the varying fluid pressures. The diaphragm is sufficiently elastic or preferably of sufficient size in addition to being relatively elastic that the positions assumed by it in transmitting the fuel or other pressure to the hydraulic fluid throughout the entire operating range of the instrument will not require the application of an appreciable force in providing for the positioning and possible stretching of the elastic diaphragm. Accordingly, the diaphragm is either sufficiently elastic or of sufficient size that it does not of itself exert a force in opposition to the pressures exerted thereon by the fuel and hydraulic fluids. The diaphragm is also of sufficient size and strength that should a break or leak occur in the hydraulic line the diaphragm is capable of assuming a position in which it is supported by the casing member without rupture and undue stretching. Thus, should a leak or break develop in the hydraulic line it would result in the diaphragm being more or less suddenly subjected to the pressure of the fuel line without being opposed by pressure of fluid from the hydraulic line. The diaphragm might accordingly be forced to a position supported by the casing member. The casing member is designed to provide this support and enable the diaphragm to withstand the force of large pressures for preventing any escape of fuel from the fuel line to the hydraulic line in which the leak or break occurred.

The system of my invention is automatically compensated for temperature changes throughout the wide range of temperatures in which the system is operated. For this purpose in each modification of the pressure transfer cell the volume of both of the chambers formed by the casing members is such that the diaphragm will not be positioned against or supported by the casing members throughout the entire range of operation for the instruments associated in the hydraulic line regardless of the effects of temperature upon the fluids in the fuel and hydraulic lines. It is accordingly of importance that chambers 41 and 141 in Figures 1 and 3, respectively contain a sufficient volume of hydraulic fluid that throughout the range of instrument operation fluid will be contained in this chamber regardless of external temperature conditions. Also, the chambers 41 and 141 of Figures 1 and 3, respectively, are of sufficient size that when in operation the diaphragms are not deflected sufficiently to receive support by the casing members within the range of operation of the instruments and throughout the range of external temperatures in which the system is operated.

In the system of my invention it is unnecessary to separately fill the instrument with fluid prior to connecting the instrument with the fluid actuating lines in an effort to prevent an unduly large volume of air from being entrapped therein and adversely affecting the instrument operation.

An important feature of my invention concerns the extremely small amount of attention that is required in the maintenance or servicing of my system and the relative freedom of any necessity for cleaning, checking and refilling of the system with hydraulic fluid when the system has initially been installed and properly sealed.

The embodiments of my invention as illustrated and described may obviously be modified within the spirit and scope of my invention and accordingly the invention is to be defined only by the scope of the appended claims.

I claim as my invention:

1. In a pressure transfer device comprising a casing, a diaphragm mounted in said casing for dividing said casing to form first and second chambers therein, a diaphragm backing member movable in said first chamber, means positioning said backing member to support said diaphragm against deflection in response to pressure exerted thereon from the opposite side, there being ledge means on the casing in the second of said chambers for providing abutment means for said backing means in said supporting position, and passageways communicating with said first and second chambers.

2. In a pressure transfer device comprising a casing, a diaphragm mounted in said casing for dividing said casing into first and second chambers, a diaphragm backing member movable in said first chamber, means positioning said backing member to support said diaphragm against deflection in response to pressure exerted thereon from the opposite side, there being ledge means on the casing adjacent the diaphragm for providing abutment means for said backing means in said supporting position, a plurality of passageways communicating with said first and second chambers, one of said passageways for supplying a transmission fluid under pressure to the second of said chambers being restricted to dampen pulsations.

3. In a pressure transfer device comprising a casing, a diaphragm mounted in said casing for dividing said casing to form first and second chambers therein, a diaphragm backing member movable in the first of said chambers, means positioning said backing member to support said diaphragm against deflection in response to the pressure exerted thereon from the opposite side, there being ledge means on the casing adjacent the said diaphragm for providing an abutment means for said backing member in supporting position, passageways communicating with said first and second chambers, one of said passageways providing for the admission of a transmission fluid under pressure to the second of said chambers, and another of said passageways providing for egress of the transmission fluid from said second chamber.

4. A pressure transfer device comprising a casing, a diaphragm mounted in said casing for dividing said casing into first and second adjacent chambers, the cross sectional area of the first of said chambers adjacent the plane of the diaphragm being larger than the cross sectional area of the second of the said chambers adjacent the plane of the diaphragm, whereby to form a ledge on the casing in the second of said chambers, a diaphragm backing member movable in the chamber having said larger cross sectional area, said backing member having a smaller cross sectional area than the maximum cross sectional area of the said larger chamber, and means for positioning said backing member to support said diaphragm against deflection in response to pressure exerted thereon from the opposite side, said ledge providing an abutment for said backing member in said supporting position, said casing having passageways giving access to and egress from said chambers.

5. A pressure transfer device comprising a casing, a diaphragm mounted in said casing for dividing said casing to form two adjacent chambers therein, a diaphragm backing member movable in one of said chambers, means positioning said backing member to support said diaphragm against deflection in response to pressure exerted thereon from the opposite side, said casing adjacent the diaphragm being provided with an abutment for said backing member in said supporting position and passages giving access to and egress from said chambers.

6. A pressure transfer device comprising a casing, a diaphragm mounted in said casing for dividing said casing to form two adjacent chambers therein, the cross-sectional area of one of said chambers adjacent the plane of the diaphragm being larger than the cross-sectional area of the other of said chambers adjacent the plane of the diaphragm, whereby to form a ledge on the casing adjacent the diaphragm, a diaphragm backing member movable in the chamber having said larger cross-sectional area, means for positioning said backing member to support said diaphragm against deflection in response to pressure exerted thereon from the opposite side, said ledge providing an abutment for said backing member in said supporting position, and there being pas-

sages in said casing giving access to and egress from said chambers.

7. A pressure transfer device comprising a casing, a diaphragm mounted in said casing for dividing said casing to form two adjacent chambers therein, a diaphragm backing member movable in one of said chambers, means for positioning said backing member to support said diaphragm against deflection in response to pressure exerted thereon from the opposite side, means for locking the positioning means whereby said backing plate is held in positions permitting and preventing deflection of said diaphragm, there being a ledge on the casing providing an abutment for said backing member in said supporting position, and there being passages in said casing, giving access to and egress from said chambers.

8. A pressure transfer device comprising a casing, a diaphragm mounted in said casing for dividing said casing to form two adjacent chambers therein, a diaphragm backing member movable in one of said chambers, means positioning said backing member to support said diaphragm against deflection in response to pressure exerted thereon from the opposite side, said casing adjacent the diaphragm being provided with an abutment for said backing member in said supporting position and passageways giving access to and egress from one of said chambers, at least one of said passageways restrictively regulating the flow of fluid therethrough.

9. A pressure transfer device comprising a casing, a diaphragm mounted in said casing for dividing said casing to form two adjacent chambers therein, a diaphragm backing member movable in one of said chambers, means positioning said backing member to support said diaphragm against deflection in response to pressure exerted thereon from the opposite side, said casing adjacent the diaphragm being provided with an abutment for said backing member in said supporting position, and passageways giving access to and egress from said two adjacent chambers, at least one of said passageways comprising a plurality of orifices adapted to restrictively regulate the flow of fluid therethrough to prevent sudden application of abnormal pressure on the diaphragm upon the occurrence of abnormal differences between the pressures of the fluid in said chambers.

10. A pressure transfer device comprising a casing, a diaphragm mounted in said casing for dividing said casing to form two adjacent chambers therein, a diaphragm backing member movable in one of said chambers, means positioning said backing member to support said diaphragm against deflection in response to pressure exerted thereon from the opposite side, said casing being provided with an abutment for said backing member in said supporting position and passageways giving access to and egress from said chambers, one of said passageways including a check valve allowing fluid entry into one of said chambers and preventing fluid egress from said chamber and also including means external to said chamber and outwardly from said valve for removably connecting a fluid supply member to supply fluid through said valve.

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