ANGELO PETIT LE BRUN.

PISTON FOR CONTROLLING FLUIDS UNDER PRESSURE.

APPLICATION FILED DEC. 19, 1916.

1,409,556. Patented Mar. 14, 1922.

2 SHEETS—SHEET 1.

Fig. 1.

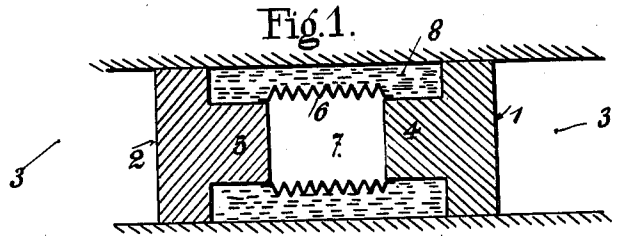


Fig. 2.

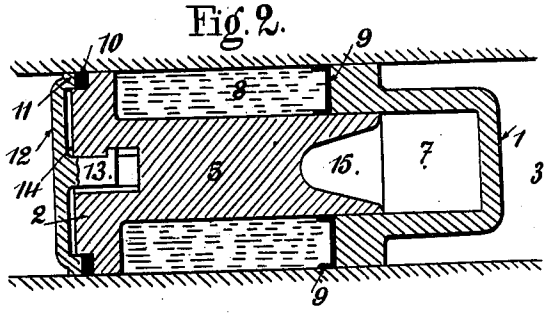


Fig. 3.

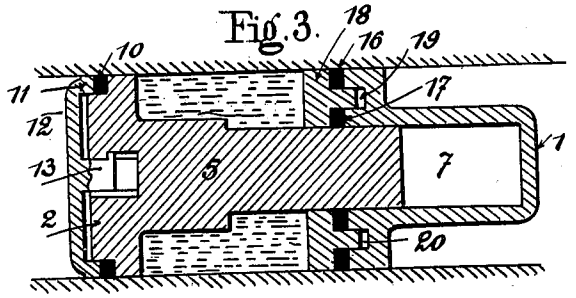
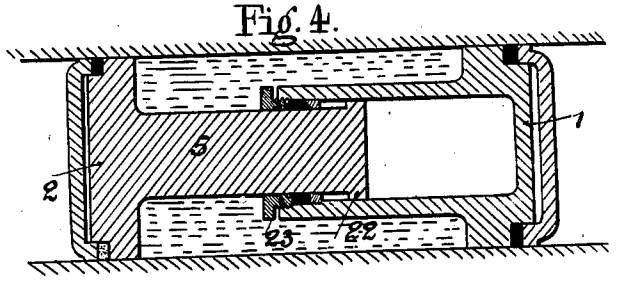


Fig. 4.



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2 SHEETS—SHEET 2.

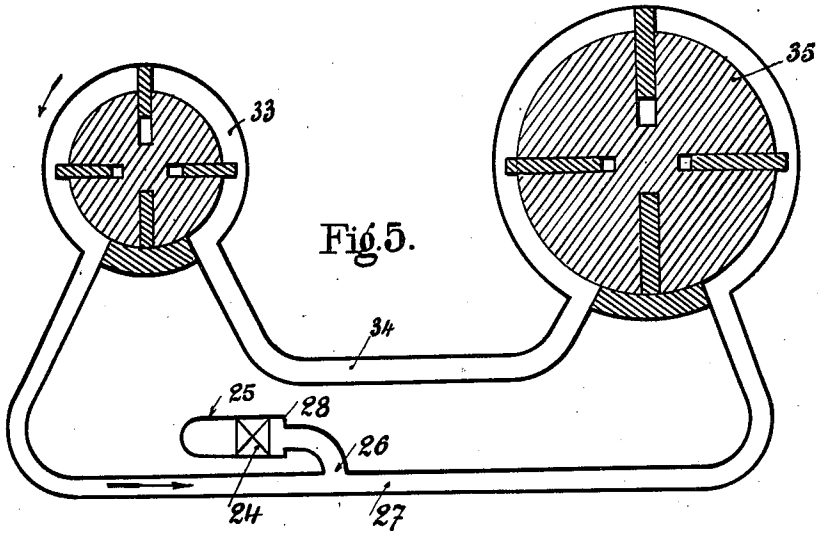


Fig. 5.

Fig. 6

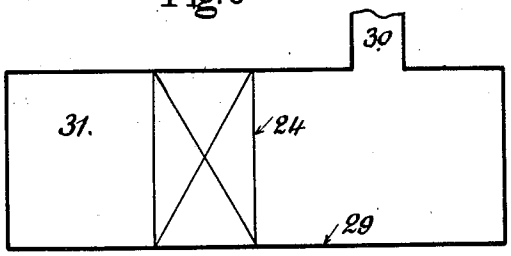
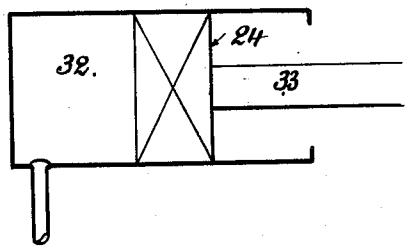


Fig. 7.



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ANGELO PETIT LE BRUN, OF PARIS, FRANCE, ASSIGNOR TO COMPAGNIE DES FORGES ET ACIERIES DE LA MARINE ET D'HOMECOURT, OF PARIS, FRANCE.

PISTON FOR CONTROLLING FLUIDS UNDER PRESSURE.

1,409,556. Specification of Letters Patent. Patented Mar. 14, 1922.

Application filed December 19, 1916. Serial No. 137,927.

(GRANTED UNDER THE PROVISIONS OF THE ACT OF MARCH 3, 1921, 41 STAT. L., 1313.)

To all whom it may concern:

Be it known that I, ANGELO PETIT LE BRUN, a citizen of the French Republic, and residing in Paris, France, 38 Rue de Berri, have invented certain new and useful Improvements in and Relating to Pistons for Controlling Fluids Under Pressure, (for which I have filed an application in France the 31st of January, 1914, Patent 475,324,) of which the following is a complete specification.

The present invention relates to a fluid-tight movable partition or piston intended to separate two fluids under pressure without permitting these fluids to mix or lose in pressure.

This result is obtained by constituting the partition of two elements adapted to approach each other by means of controlling members or otherwise, and compressing a fluid-tight packing interposed between the two elements, a space being provided between them in such a manner that the parts of the elements which correspond to this space, support a reaction the pressure per unit of area of surface exposed to it of which is less than that of the pressure exerted on either side of the partition as long as the two elements constituting the latter have not come into actual contact.

The accompanying drawing illustrates diagrammatically various constructional forms of the invention.

Figure 1 is a diagram showing the principle underlying the fluid-tight partition according to the invention,

Figures 2 to 4, illustrate diagrammatically constructional forms of this invention,

Figure 5 illustrates the application of this partition to a hydraulic transmission,

Figure 6 shows diagrammatically the method of using the invention for an apparatus such as a compressed air accumulator.

Figure 7 shows another application in which the fluid-tight partition is provided with a rod extending into the atmosphere, the whole constituting the piston of a pump, compressor or accumulator.

Referring to Figure 1, the movable fluid-tight partition comprises two elements 1, 2 arranged in a common conduit 3, in which this partition must move whilst maintaining a fluid-tight separation between its two sides. Each of the elements 1 and 2, for instance, of circular cross-section, has a constricted portion 4 and 5, these two portions being turned towards each other and connected by means of a longitudinally extensible member 6, which is rigid in a radial direction and soldered or welded to each of the portions 4 and 5, so as to produce between the same, a space 7 which in the mounted position illustrated in Figure 1, is filled with air under atmospheric pressure or even at a lower pressure.

The annular space existing around the members 4 and 5 and the space or chamber 7, is filled with a plastic or elastic material 8 such as, for example, grease, greasy fibres, india-rubber and the like.

After mounting, the conduit 3 is supposed to be filled on either side of the partition with fluids under pressure.

Neglecting the small pressure of the air contained in the chamber 7, the total pressure exerted on one of the elements 1 or 2, may be regarded as being transmitted integrally to the plastic material 8 on an annular section obviously smaller than that of the elements 1 and 2 because the constricted members 4 and 5 of the said elements which constitute the extreme walls of the chamber 7, support an insignificant reaction. It follows therefrom that the unitary pressure or pressure per unit of area of surface exposed to it, in this material 8 is greater than that which the fluids under pressure exert on one or the other of the elements 1 or 2, and proportional to the said pressure.

The increase of pressure in the plastic material will be greater the smaller the annular section of this material owing to the widening of the chamber 7.

The pressure per unit of area of surface exposed to it of the plastic material 8 being greater than that exerted on each of the elements 1, 2, it follows therefrom that a fluid-tight separation is obtained between the chambers delimited by the elements 1 and 2, that is to say it is impossible for the fluids placed on either side of the partition to mix. The plastic material 8 may tend to escape on either side, but the constructional forms described hereinafter will illustrate the precautions taken in order to avoid this occurrence.

If the movable partition moves in the conduit 3 whilst supporting on its extreme faces the same or different pressures, the pressure per unit of area of surface exposed to it of the plastic material 8 being always greater than those acting on the external faces of the elements 1, 2, the fluid-tightness will continue irrespective of the position of this partition.

In the constructional form of the movable partition illustrated in Figure 2, the chamber 7 is provided within one of the elements, for instance, in the element 1 and the constricted portion 3 of the other element slides in this chamber. The plastic material 8 cannot penetrate this chamber owing to the interposition of the packing 9, for example a cupped leather, creating fluid-tightness between the part 5 and the element 1, so as to maintain the chamber 7 devoid of pressure. This packing bears also on the wall of the conduit 3 so as to avoid any loss of plastic material 8 on that side of the partition. The plastic material 8 may be maintained in the same manner on the side of the element 2 or, as illustrated, by means of a plastic or elastic packing 10 located in a recess formed in the element 2 and upon which bears the annular edge 11 of the plate 12 which may be rendered integral with the element 2, for instance, by a bayonet joint 13. A space 14 existing between the said plate and the element 2 permits of compressing the packing 10 to a greater extent than the material 8 so as to obtain fluid-tightness in a similar manner to what is effected for the plastic material 8, this compression being susceptible, however, of being produced in any suitable way.

If during the displacements of the movable partition, a leakage of the material 8 takes place on either side of the said partition notwithstanding the provision of the packing 9 and 10, the member 5 will penetrate the chamber 7 to a greater extent so that the pressure of the plastic material 8 will remain greater than the pressure of the fluids acting on the elements 1, 2 and fluid-tightness will be ensured for all conditions of operation as long as the pressure in the chamber 7 is somewhat less than that of the fluids in the conduit 3. As long as the elements 1 and 2 do not come into actual contact, the pressure in the chamber 7 will never be equal or approximately equal to the pressure existing in the conduit 3 if a recess 15 is formed at the end of the member 5 which increases the volume of the chamber 7.

In the constructional form illustrated in Figure 3, the fluid-tightness on the external surface of the element 2 is obtained as in the case of the construction illustrated in Figure 2, but the element 1 is provided with a group of two packings 16 and 17 compressed by a ring 18 provided with an annular shoulder 19 penetrating a correspondingly shaped recess 20 formed in the element 1, thus ensuring fluid-tightness on the same principle of over or excess pressure.

Finally, Figure 4 shows the location of the two elements 1 and 2 which is similar to that of the elements 2 in Figures 2 and 3. In this constructional form, however, the member 5 is terminated by a shoulder 22 limiting the space of the elements 1 and 2. The fluid-tightness of this part is ensured by the stuffing-box 23 which forms an abutment for the shoulder 22.

The arrangement of the parts may obviously be varied provided the two elements 1 and 2 effect a relative movement, which may or may not be controlled, in order to compensate for possible leakages of the plastic material 8, provided this substance is stored between the elements 1 and 2 in a section smaller than that of the elements, in order to obtain, in the substance, a unitary and suitably greater pressure ensuring fluid-tightness. A suitable filling member may be provided, so as to permit of the introduction of the plastic material 8, even in operative position, in the case where this material is constituted by grease or other flowing material.

This movable fluid-tight partition may be applied, for example, to hydraulic transmissions for motor cars or other applications as illustrated in Figure 5. 33 designates a primary hydraulic motor, operated by any engine, and connected through the medium of the conduits 27 and 34 to a secondary hydraulic motor 35, the conduit 27, being for example, the conduit under pressure for operation in the normal direction. The movable partition 24 is arranged in a chamber 25 closed hermetically at one end and communicating freely at its other end 26 with the conduit 27 containing liquid under pressure. A shoulder 28 preferably limits the stroke of the partition 24 in order to maintain a suitably predetermined pressure for the gas occupying the space comprised between this partition and the end of the chamber 25. The compressed gas can, however, be replaced by a spring or a group of springs. In the inoperative position, when the partition 24 abuts against the shoulder 28, it prevents any leakage of gas the pressure of which is always transmitted to the plastic material.

In the case of the application of the invention to an air accumulator as illustrated in Figure 6, the movable partition 24 which, as in the preceding case, may have the form shown in Figures 2 to 4, is subjected in the accumulator 29 to the pressure of water or other fluid entering through the pipe 30, the chamber 31 containing compressed air or a fluid preferably elastic and under pressure, or a spring.

In the constructional forms illustrated in

Figures 5 and 6, the movable partition 24 avoids any mixing of the fluid forming an elastic cushion with the other fluid, liquid or gaseous, belonging to the transmission, or intended to perform any kind of work, this partition 24 being capable of movement, without interfering with its fluid-tightness, according to the various conditions of operation.

Finally, according to Figure 7, it is possible to provide this movable partition 24 with a rod 33 in order to cause it to transmit the thrust of a liquid contained in the chamber 32 or compress any liquid.

The movable fluid-tight partition according to the invention, may be utilized for separating two liquids under pressure, whether these fluids are liquid or gaseous. It may also serve for the insulation of a single fluid under pressure in contact with one of the faces of the partition, the other face of which would then be in contact with atmospheric air by supporting directly or through the medium of a rod, a resistance equilibrating the pressure of the fluid.

The invention may be applied in all cases where use is made of compressed air or any other gas or fluid, elastic or not, under pressure, particularly when it is desired to retain a certain volume of fluid under pressure without any outlet, as is the case, for example, in shock absorbers, compressors, railway brakes, artillery brakes, shock deadeners and so on.

What I claim is:—

1. A piston embodying opposed spaced members and interposed plastic packing between said members, the packing being engaged by portions of the piston members of less area than the area exposed to external pressure.

2. A piston comprising opposed spaced members relatively movable toward and away from each other and having a centrally disposed chamber and compressible cylindrical packing capable of flowing, between portions of the piston members, said packing being engaged by the portions of the piston members of less area than the area exposed to external pressure.

3. A piston comprising opposed spaced members having centrally reduced portions between which a chamber is formed, a plastic packing of cylindrical form disposed between the parts of the piston members beyond the said chamber, the packing being engaged by portions of the piston members of less area than the area exposed to external pressure.

4. A piston comprising opposed spaced members relatively movable toward and away from each other, one of said members having a centrally disposed reduced portion and a plastic packing mounted upon the reduced portion of the piston and capable of flowing, the packing being engaged by portions of the piston members of less area than the area exposed to external pressure.

In testimony whereof I have hereunto set my hand at Paris (France), this 28th day of November, 1916.

A. LE BRUN.

In the presence of—
L. DE CAUDI,
PICHCE DAE.