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FLUID PRESSURE APPARATUS

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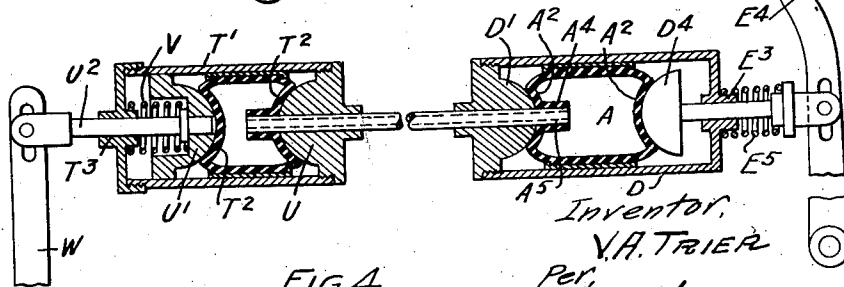
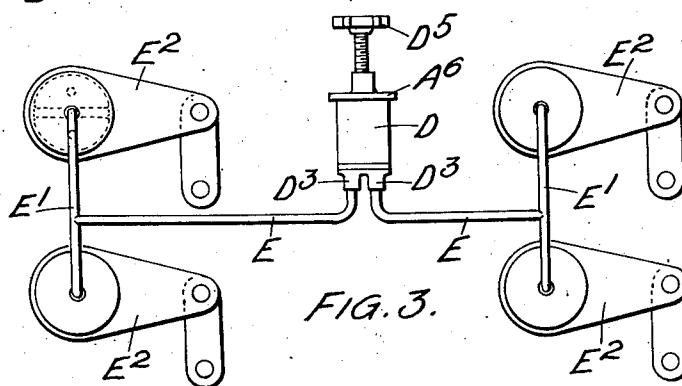
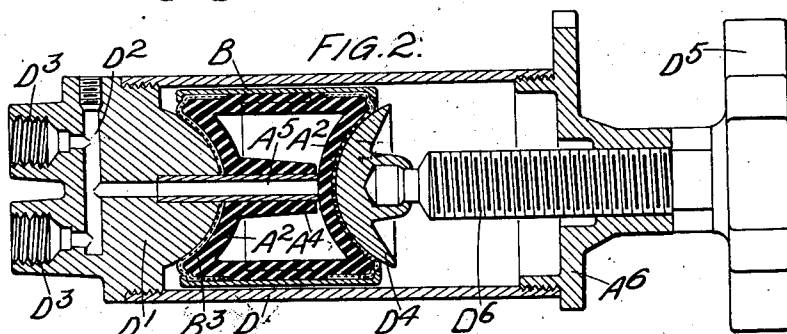
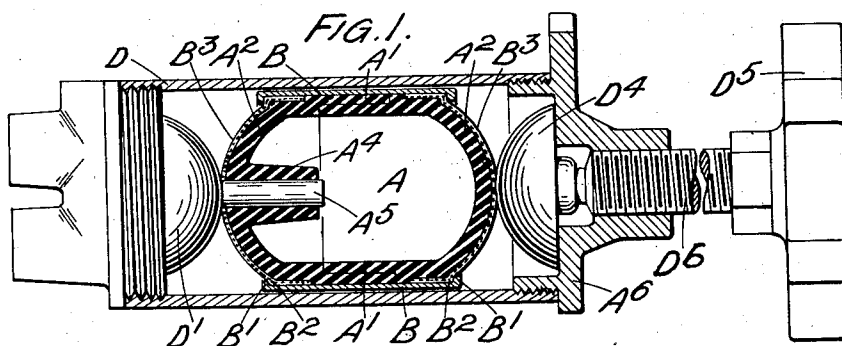


FIG. 4

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FLUID PRESSURE APPARATUS

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5 Claims. (Cl. 60—54.6)

This invention relates to fluid pressure apparatus of the kind in which the fluid pressure can either be controlled by one or more movable control members or in which variations in the fluid pressure due to the action of a control member or to other causes acts through pressure-responsive apparatus to cause movement of or to vary the force applied to some part, and has for one of its objects to provide a simple and efficient form of apparatus through which either pressure can be applied to fluid in the fluid pressure apparatus or through which mechanism can be acted upon by pressure within the fluid pressure apparatus.

In the accompanying drawing,

Figures 1 and 2 illustrate, partly in longitudinal section, one construction according to the invention,

Figure 3 shows on a smaller scale apparatus as illustrated in Figures 1 and 2 applied to a set of vibration dampers of the friction type,

Figure 4 shows yet another arrangement.

In the construction illustrated in Figures 1 and 2, the apparatus comprises a container A having a cylindrical side wall A¹ and part-spherical end walls A² formed of fluid-tight flexible material, for example india rubber. The side wall A¹ of the container is held from radial expansion and elongation under the action of the fluid pressure within the container A by a cylindrical metal or other inexpandible sheath B the ends of which are turned inwards at B¹ to provide a clinch to prevent longitudinal expansion of the side wall A¹, these intumed ends B¹ engaging shoulders B² formed at the point where the end walls A² meet the side wall A¹. Each of the end walls A² is reinforced by fabric B³ conveniently vulcanized into the rubber or like elastic material, this reinforcement B³ extending a short distance down the side wall A¹ beyond the clinch B¹. From the centre of one of the part-spherical end walls A² extends inwards a rubber neck or tube A⁴ of small diameter into which a pipe A⁵ can be inserted so as to communicate with the interior of the container. It will be seen that fluid pressure within the container A will act on the outer surface of the tube A⁴ so as to tend to maintain it in liquid-tight engagement with the pipe A⁵.

The container A is formed from two parts, each part comprising the part-spherical end wall A² and a portion of the cylindrical wall A¹. The open end of one of the two parts which are to constitute the cylindrical wall A¹ of the container A, is formed so as to fit over the open end of the other part so that these parts telescope one over

the other to provide a closed vessel as shown. The joint between the overlapping or telescoping parts may if desired be vulcanized or cemented. For example, where cementing is employed the outer one of the two telescoping parts is conveniently folded back so that what is to be the inner surface is exposed and this surface, as well as the outer surface of the other part, then have solution applied to them. The outer part is then rolled down over the inner part so that the two become firmly cemented together. The joint may then be vulcanized in a suitable mould, internal pressure being applied either by delivering fluid under pressure to the interior of the container A or by inserting a substance in the container, which substance vaporizes under the vulcanizing heat and so generates fluid pressure within the container.

In an alternative arrangement the two halves of the rubber container A may simply be inserted into opposite ends of the metallic sheath B without the cylindrical parts overlapping one another, and may form a fluid-tight joint with this sheath, a solution or cement being employed to assist in maintaining this fluid-tight joint between each part of the rubber container A and the metallic sheath B.

The container A formed in the above manner is arranged so as to slide longitudinally within a housing D one end of which has mounted within it a stationary pressure member D¹ carried by an end plug which is threaded to engage the housing D. The pressure member D¹ has a radius of curvature somewhat smaller than that of the adjacent end wall A² of the container A, the pipe A⁵ which extends within the container A passing through the centre of the pressure member D¹ as clearly shown in Figure 2 and communicating through a bore D² with sockets D³ internally threaded for connection to the fluid pressure system to be controlled. The surface of the pressure member D¹ and the adjacent end A² of the container A lie end to end with their convex surfaces adjacent to one another. Arranged in the other end of the housing D is a further pressure member D⁴ also having a convex part-spherical surface with a slightly smaller radius of curvature than that of the adjacent end A² of the container A, the pressure member D⁴ being rotatably carried on the inner end of a spindle D⁶ which is in threaded engagement with an end cap A⁶ threaded to engage the housing D, the spindle D⁶ being furnished at its outer end with a hand wheel D⁵.

When the hand wheel D⁵ is rotated so that

the movable pressure member D⁴ is caused to bear on the adjacent end A² of the container A, the pressure member D⁴ causes deformation of this end of the container A and the force thus exerted on the container causes bodily axial movement thereof so that the fixed pressure member D¹ also bears on and deforms the opposite end of the container A, as clearly shown in Figure 2. In this way the pressure of fluid within the container A and hence in the fluid pressure system with which the pipe A⁵ communicates through the bore D² and sockets D³, can be controlled.

Figure 3 illustrates one way in which apparatus according to the invention may be applied to control a series of vibration dampers of the friction type. In the construction shown each of the sockets D³ of apparatus as described with reference to Figures 1 and 2 is connected by a pipe E to a pipe E¹ communicating at opposite ends respectively with two vibration dampers E², for example of the type described in the specification of United States of America Patent No. 1,909,154. By rotating the hand wheel D⁵ the fluid pressure in the pipes E and E¹, and therefore the pressure applied to the vibration dampers E², can be adjusted as desired.

As illustrated in Figure 4 there is shown a container A similar to that illustrated in Figure 1 which communicates through a pipe S with a container T arranged within a casing T¹ and having convex end walls T² of flexible material, this container being similar to the container A. A fixed convex pressure member U and a movable convex member U¹ are held in engagement with the convex walls T² by a spring V acting on the convex pressure member U¹ which is carried on the inner end of a spindle U² slidable longitudinally in a bearing T³ formed in one end wall of the casing T¹. The outer end of the spindle U² is operatively connected to a lever W through which the brakes of a vehicle can be operated. The movable pressure member D⁴ associated with the container A is carried on the inner end of a longitudinally movable spindle E³ the outer end of which is operatively connected to a brake pedal E⁴.

When the parts are in their normal positions shown in the drawing and the brake pedal E⁴ is actuated the walls A² of the container A are deformed by the pressure members D⁴, D¹, whereby the pressure within the container T is increased and the pressure member U¹ thus moved outwards to operate the brake lever W. When the brake pedal E⁴ is released the spring V moves the pressure member U¹ back towards the position shown so that the lever W is moved to release the brakes, a spring E⁵ at the same time restoring the brake pedal E⁴ to its inoperative position.

It is to be understood that the constructions more particularly described above are given by way of example only and that constructional details may be modified considerably according to the purpose for which the invention is intended, the degree of variation in pressure desirable in the fluid pressure system and other requirements without departing from this invention. Further, although the invention has been more particularly described as applied to fluid pressure apparatus for controlling brakes, vibration dampers, throttle controls and the like on vehicles, it may be applied to apparatus for controlling direction indicators, dipping head lights or other purposes, whether employed on vehicles or not. Again, the invention may be applied to fluid pressure apparatus in which im-

pulses are transmitted through a fluid, apparatus according to the invention being employed for transmitting or receiving the impulses, for varying the static pressure in the system or for other purposes.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In fluid pressure apparatus, in combination, a fluid container having a passage through which fluid pressure can be transmitted to and from the interior of the container, fluid within the container, end walls on the container each constructed of flexible material and of convex form, an inexpandible side wall connecting the end walls, a guide in which the container can slide along a longitudinal axis, a thrust member associated with one convex end wall and having a corresponding convex surface, and a thrust member associated with the other convex end wall and having a corresponding convex surface, the thrust members being relatively movable towards and away from one another so that when the thrust members are moved towards each other they will bear on and deform the associated convex walls of the container and transmit fluid pressure from the container, whereas an increase in the fluid pressure transmitted to the interior of the container will tend to cause the end walls to move outwards and thus move the thrust members away from each other.

2. In fluid pressure apparatus, in combination, a fluid container having a passage through which pressure fluid can be transmitted to and from the interior of the container, fluid within the container, end walls on the container each constructed of flexible material and of convex form, an inexpandible sheath for holding the container from radial expansion, means on the sheath for preventing longitudinal expansion of the side wall of the container, a guide in which the container and sheath can slide along a longitudinal axis, a thrust member associated with one convex end wall and having a corresponding convex surface, and a thrust member associated with the other convex end wall and having a corresponding convex surface, the thrust members being relatively movable towards and away from one another so that when moved towards each other they bear on and deform the associated convex walls of the container thereby causing increase of the pressure within the container and therefore of the pressure to be controlled.

3. In fluid pressure apparatus, in combination, a cylindrical fluid container having a passage through which pressure fluid can be transmitted to and from the interior of the container, fluid within the container, end walls on the container each constructed of flexible material and of convex form, an inexpandible cylindrical sheath for holding the container against radial expansion, means on the sheath for preventing longitudinal expansion of the cylindrical wall of the container, a cylindrical casing in which the container and sheath can slide along a longitudinal axis, a thrust member associated with one convex end wall and having a corresponding convex surface, and a thrust member associated with the other convex end wall and having a corresponding convex surface, the thrust members being relatively movable towards and away from one another so that when moved towards each other they bear on and deform the associated convex walls of the container and increase the pressure within the container thereby increasing the pressure to be controlled.

4. In fluid pressure apparatus, in combination, a fluid container, fluid within the container, end walls on the container each constructed of flexible material and of convex form, an inexpandible material and of convex form, an inexpandible side wall connecting the end walls, a guide in which the container can slide along a longitudinal axis, a thrust member associated with one convex end wall and having a corresponding convex surface, and a thrust member associated with the other convex end wall and having a corresponding convex surface, one convex end wall having a passage therethrough and a resilient tubular sleeve formed integral with and extending inwardly from said convex end wall, and a tubular extension on the associated pressure member through which pressure fluid can be transmitted to and from the container, said tubular extension passing through the passage in said end wall so as to be embraced by the sleeve and to communicate with the interior of the container, the thrust members being relatively movable towards and away from one another so that when moved towards each other they bear on and deform the associated convex walls of the container and increase the pressure within the container, thereby increasing the pressure to be controlled.
5. In fluid pressure apparatus, in combination, a fluid container, fluid within the container, end walls on the container each constructed of flexible material and of convex form, an inexpandible material and of convex form, an inexpandible side wall connecting the end walls, a guide in which the container can slide along a longitudinal axis, a thrust member associated with one convex end wall and having a corresponding convex surface, a thrust member associated with the other convex end wall and having a corresponding convex surface, one convex end wall having a passage therethrough and a resilient tubular sleeve formed integral with and extending inwardly from said convex end wall, and a tubular extension on the associated pressure member through which pressure fluid can be transmitted to and from the container, said tubular extension passing through the passage in said end wall so as to be embraced by the sleeve and to communicate with the interior of the container, the thrust members being relatively movable towards and away from one another so that when moved towards each other they bear on and deform the associated convex walls of the container and increase the pressure within the container thereby increasing the pressure to be controlled.
- VERNON ANTHONY TRIER