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HYDRAULIC DISTRIBUTOR

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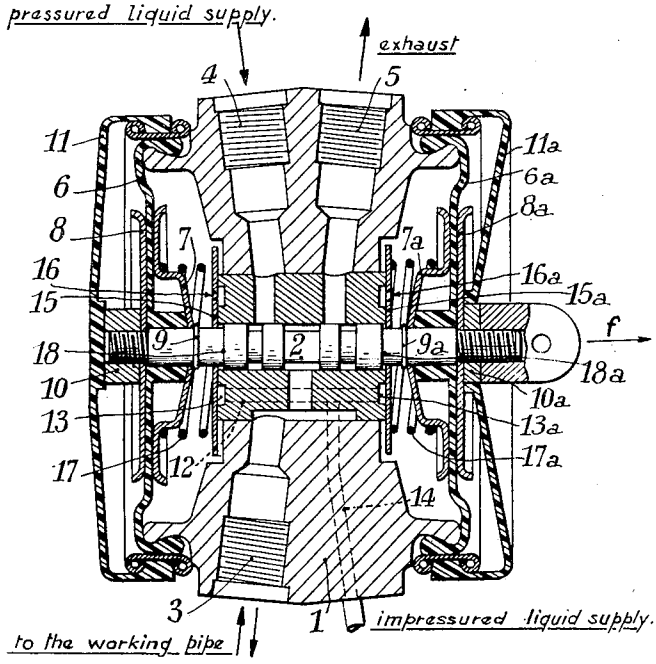

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HYDRAULIC DISTRIBUTOR

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It is known through my copending patent application Ser. No. 796,857 filed on March 3, 1959, of which this application is a continuation in part, to provide a hydraulic distributor of which the control member is adapted to either isolate a load line or cause the latter to communicate with a source of compressed fluid, with an exhaust, according to the position of the control member on either side of an intermediate position.

It is an essential object of said copending application to provide a hydraulic distributor of the type broadly set forth hereinabove which is provided with a retarding means also of the hydraulic type which is adapted to resist the movement of said control member when said member is moved away from its intermediate position and to permit this movement without interfering therewith when said control member moves toward its intermediate position.

It is another object of the copending application to provide a hydraulic distributor of this type wherein the control member consists of a slide valve, the fluid distribution being controlled directly by the axial movement of this slide valve.

Furthermore, this copending application aims at providing a hydraulic distributor of the type set forth, wherein said slide valve projects at either end from the distributor body with two end portions housed respectively in two lateral chambers filled with liquid, said slide valve controlling the movements of this liquid from one chamber to the other through a constricted passage when said slide valve is moved away from its intermediate position.

It is the essential object of the distributor construction forming the subject-matter of the present application to embody the different objects set forth hereinabove as well as additional objects set forth hereinafter.

It is therefore another object of this application to provide a distributor having a simpler structure than that described in the copending application.

It is a further object of the present application to provide an improved arrangement wherein the two lateral chambers have their inner space free of any partition or wall therebetween, so that any slide valve movement will reduce the volume of one chamber while increasing the volume of the other chamber, the liquid flowing from the first chamber to the other chamber through a passage providing a communication between said chambers through the distributor body.

Finally, it is an object of this application to provide means for retarding the liquid flowing through said passage, as well as an arrangement whereby said first means are rendered inoperative when the direction of the slide valve movement is such that this slide valve moves toward its neutral or inoperative position.

With the foregoing and other objects in view, the invention resides in the novel arrangement and combination of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit and scope of the invention.

Other objects and advantages will become apparent from the following description taken in conjunction with the accompanying drawing, of which the single FIGURE

shows in axial section a distributor constructed according to the teachings of this invention.

This distributor comprises a body **1** through which a substantially axial passage is formed and receives a control slide valve **2** having two cylindrical end portions projecting on either side of the lateral faces of the body **1**. In its intermediate position, as shown in the figure, this control slide valve isolates a load pipe line (not shown) connected to the orifice **3**. In positions departing from this intermediate position, that is, to the left and to the right as seen in the drawing, this slide valve **2** connects the line **3** either with the supply of compressed liquid connected to the orifice **4**, or to an exhaust port **5**.

The left-hand end of slide valve **2** has fitted thereon the axial integral socket of a flexible diaphragm **6** of resilient material. The central portion of the flexible diaphragm **6** is retained and fastened to the slide valve **2** by means of a pair of metal disks **7**, **8** disposed on either side of the socket; one disk **7** engages a circlip **9** fitted in a circular grooove formed in the slide valve, and the other **8** is locked by means of a nut **10** engaging the screw-threaded end projecting from the cylindrical end portion of the slide valve **2**. The circular outer periphery of the diaphragm **6** is clamped on the outer circular contour of the left-hand lateral face of the body **1** so as to form a lateral chamber between this face and the diaphragm. On the right-hand side, as shown in the drawing, the slide valve **2** has mounted thereon elements **9***a*, **7***a*, **6***a* and **8***a* exactly symmetrical to the elements **9**, **7**, **6**, **8** described hereinabove. The tapped element **10***a* similar to the nut **10** has the same function as the latter but, in addition, it is shaped to permit the control of the sliding movements of the slide valve **2**. Another pair of flexible diaphragm **11**, **11***a* have their central portions secured on the tapped members **10**, **10***a* on either side of the slide valve **2**, and the circular outer periphery of these other diaphragms are clamped over those of diaphragms **6**, **6***a* respectively. The only function of these diaphragms **11**, **11***a* is to protect the outer faces of diaphragms **6**, **6***a*.

The two lateral chambers formed by the diaphragms **6**, **6***a* on either side of the body **1** communicate with each other through a passage **12** formed through the body **1** and opening into a pair of circular grooves **13**, **13***a* formed in the two lateral faces of the body around or concentrically to the cylindrical end portions of slide valve **2**. This passage **12** communicates with a duct **14** connected with a reservoir containing a liquid at the atmospheric pressure which fills the two chambers and the duct **12**.

Engaging each lateral face of the body **1** is an annular plate **15**, **15***a* in which a small calibrated hole **16**, **16***a* is formed so as to register with a circular groove **13**. **13***a* formed in the relevant face of the body **1**.

Each chamber has housed therein a light coil compression spring **17**, **17***a* bearing against the corresponding disk **7** or **7***a* and urging the annular plate **15** or **15***a* toward the relevant lateral face of the body **1** in this chamber. When the slide valve **2** is in the intermediate position illustrated in the drawing the two annular plates **15**, **15***a* are pressed by the springs **17**, **17***a* against the two lateral faces of the body. Each cylindrical end portion of the slide valve **2** on which the annular plate **15** or **15***a* is slidably fitted is limited by a projecting shoulder **18**, **18***a* of which the outer diameter is greater than the inner diameter of the plate so that, in the aforesaid intermediate position of the slide valve which is shown in the drawing, this shoulder is substantially flush with—and preferably slightly recessed from—the lateral face of the body **1** from which this end portion of the slide valve **2** projects.

This distributor operates as follows:

When the slide valve 2 under the control of the screwed element 10*a* is in the intermediate position shown in the drawing the load pipe line 3 is isolated from the compressed liquid inlet orifice 4 and also from the exhaust orifice 5. When the slide valve 2 is moved either in the direction of the arrow *f* or in the opposite direction, this load line 3 is caused to communicate either with the exhaust 5 or with the inlet 4. If for example the slide valve 2 is pulled in the direction of the arrow *f*, the diaphragm 6 will move toward the body and the volume of the relevant lateral chamber decreases, but the liquid contained in this chamber cannot escape toward the other expanded chamber unless it flows to the duct 12 through the calibrated orifice 16 formed in the annular plate 15 urged by the spring 17 and also by the liquid pressure exerted against the registering face of body 1, this liquid subsequently flowing into the other opposite chamber in which the shoulder 18*a* keeps the annular plate 15*a* spaced from the lateral wall of body 1. The movement of the slide valve in the direction away from its intermediate position is thus retarded. When the slide valve having thus been moved in the direction of the arrow *f* returns to its intermediate or initial position, that is, in the direction opposite to that shown by the arrow, the volume of the chamber bound by the diaphragm 6*a* decreases as the volume of the chamber bound by the diaphragm 6 increases, and under these circumstances the liquid compressed in chamber 6*a* escapes therefrom without encountering any resistance since the shoulder 18*a* keeps the annular plate 15*a* away from the body 1. The expanded chamber bound by the diaphragm 6 is supplied with liquid also without any resistance since the liquid entering the annular groove 13 will easily move the annular plate 15 away from the body 1 against the weak resistance of spring 17. The operation is exactly the same when the slide valve 2 moves away from the intermediate position of the drawing but in the direction opposite to that shown by the arrow *f* and when it returns from this outer position to the intermediate position.

The above-described distributor, like the one described and illustrated in my compending patent application Ser. No. 796,857 of March 3, 1959, may be used in hydraulic systems of the type designed for maintaining automatically the level of the frame of a vehicle by resiliently connecting the slide valve 2 to a member responsive to this level. However, the distributor of this invention is also applicable to many apparatus and systems in which its specific function or mode of operation is deemed useful.

What I claim is:

1. A hydraulic distributor comprising a body having two opposite lateral faces and connected to a source of compressed liquid, to an exhaust and to a load pipe line, a control slide valve slidably fitted in said body and formed with two cylindrical end portions projecting from said body through said lateral faces respectively, said slide valve being adapted to occupy an intermediate position in which it closes the connections between said body on the one hand and said source and said exhaust on the other hand, and other positions shifted on either side of said intermediate position, wherein said slide valve causes one of said last-named connections to communicate with said load pipe line, two resilient diaphragms having each a central portion secured on one of said end portions of the slide valve and a peripheral outer portion fastened on the outer peripheral contour of the lateral face of the body through which said end portion projects, said two diaphragms forming two lateral chambers on either side of said body, a passage formed through said body and interconnecting said chambers,

said passage having two openings leading respectively through said lateral faces of said body, a liquid filling said two lateral chambers and said passage, valve means housed in each chamber and adapted to occupy an operative position in which it co-acts with the lateral face of the body which bounds the relevant chamber for reducing to a narrow orifice the opening of the passage leading through the lateral face of the body which limits said chamber so as to throttle the liquid flowing from said chamber to the other chamber through said passage, resilient means housed in each chamber and adapted to urge said valve means toward its operative position, and release means carried by each one of said end portions of the slide valve for moving said valve means away from its operative position against the resistance of said resilient means when said slide valve is shifted from its intermediate position toward said lateral chamber.

2. A hydraulic distributor comprising a body having two lateral faces and connected to a source of compressed liquid, to an exhaust and to a load pipe line, a control slide valve slidably fitted in said body and formed with two cylindrical end portions projecting from said body through said lateral faces respectively, said slide valve being adapted to occupy an intermediate position in which it closes the connections between said body on the one hand and said source and said exhaust on the other hand, and other positions shifted on either side of said intermediate position, wherein said slide valve causes one of said last-named connections to communicate with said load pipe line, two resilient diaphragms having each a central portion secured on one of said end portions of the slide valve and a peripheral outer portion fastened on the outer peripheral contour of the lateral face of the body through which said end portion projects, said two diaphragms forming two lateral chambers on either side of said body, a passage formed through said body and interconnecting said chambers, said passage having two end openings leading respectively through said lateral faces of said body, a liquid filling said two lateral chambers and said passage, an annular shutter plate housed in each chamber, each annular shutter plate having an inner circular contour slidably fitted on that cylindrical end portion of the slide valve which projects through the lateral face of the body which limits said chamber and having a calibrated hole formed therein in front of the passage opening formed in said lateral face, a spring housed in each chamber and having one end bearing against said central portion of the relevant diaphragm forming this chamber and another end urging said annular shutter plate to an operative position on the lateral face of the body which limits said chamber and a shoulder carried by said cylindrical end portion of the slide valve, for moving said annular shutter plate away from its operative position against the resistance of said spring when the slide valve is shifted from its intermediate position toward said lateral chamber.

3. A hydraulic distributor as set forth in claim 2, wherein the end opening of said passage which leads through each lateral face of said body consists of an annular groove formed in said lateral face of said body around the relevant cylindrical end portion of the slide valve which projects through said lateral face.

4. A hydraulic distributor according to claim 2, comprising another pair of flexible diaphragms each having on the one hand a central portion fastened on one of the two end portions of the slide valve beyond the central portion of that one of said first-named pair of flexible diaphragms of which the central portion is fastened to the same slide valve end portion, and on the other hand an outer peripheral portion fastened to the peripheral portion of said one of the two first flexible diaphragms.

No references cited.