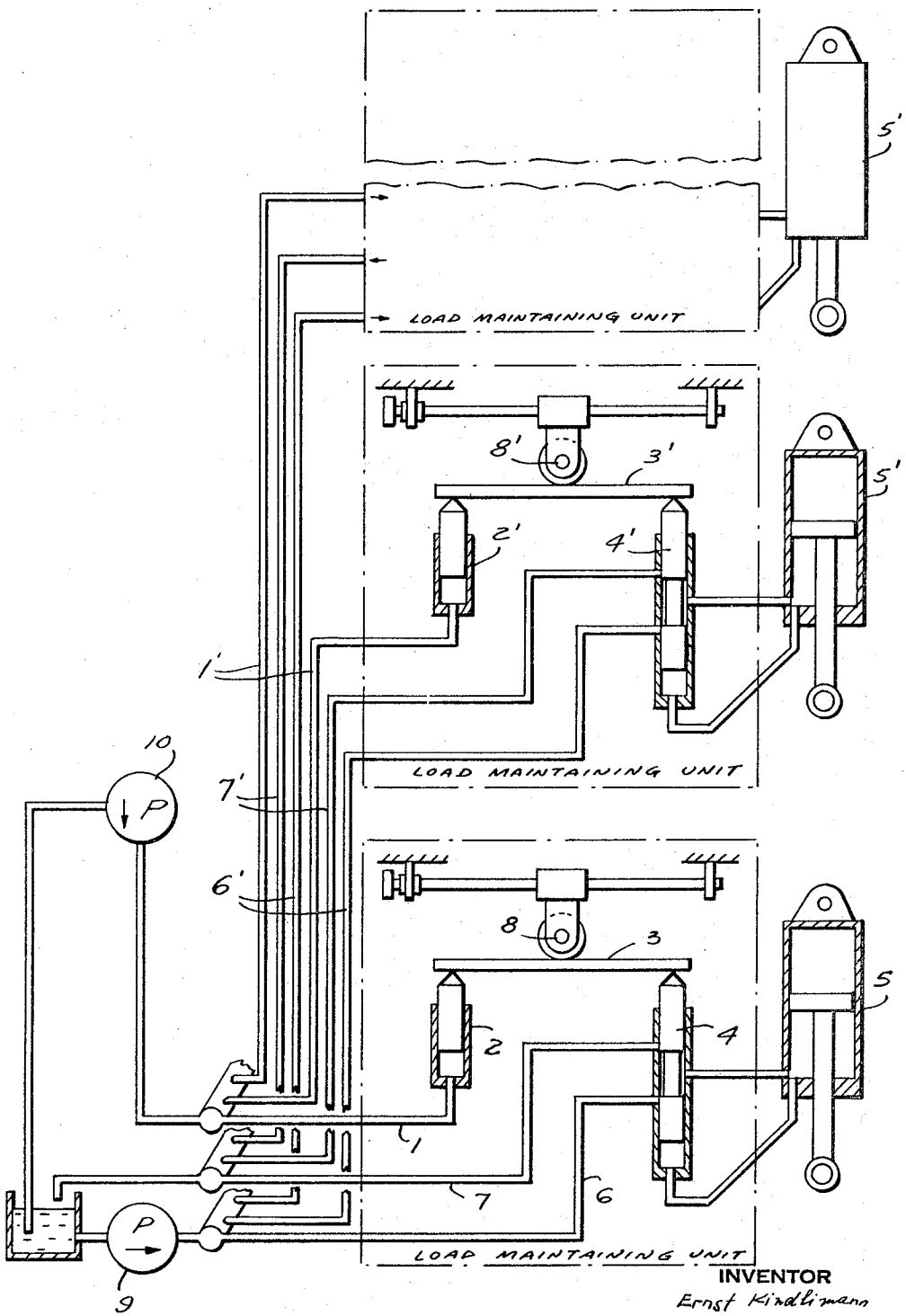
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LOAD MAINTAINING UNIT FOR HYDRAULIC FATIGUE LOADING MACHINES

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LOAD MAINTAINING UNIT FOR HYDRAULIC FATIGUE LOADING MACHINES

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4 Claims. (Cl. 91—414)

The instant invention relates to hydraulic machines for applying loads to solid structure to determine their behavior as to fatigue, and more particularly to arrangements for maintaining a predetermined load or ratio between components of a load applied to different portions of the structure under test where the individual loads are all obtained from a common hydraulic source.

In that the sectional area of the cylinders of pressure applying mechanisms, of which a plurality are employed in hydraulic machines for fatigue testing of physical structures, the hydraulic pressure applied to the working pistons therein must be varied in order to obtain variations in the loads applied to the test structures. However, varying the pressure delivered thereto by the hydraulic pump will not produce the desired result where several working cylinders are to be supplied with different working pressures. By interposing pressure maintaining units between the supply pump and the working cylinders, it is possible to regulate the load applying pressures to the desired magnitudes. Prior pressure maintaining units bring about equalization with the working pressures by means of a control unit having adjustable components of a weight or of a spring but have the disadvantage of being but slowly regulatable. Furthermore, on the parallel and simultaneous regulation of a plurality of such units, there is no direct assurance that all working pressures remain in the same relation to each other in that deviations in mechanical adjustment do not automatically correct themselves. Particularly when the changes in applied load are rapidly made, as is the case in fatigue testing, as also in all cases in which the load distribution on the structure under test must at all times remain in the same constant relationship with its components, as is particularly true with sensitive structures, such as aircraft, for example.

An object of the instant invention is to eliminate these shortcomings by providing an arrangement in which this equalization or bringing into equilibrium with the working pressures is obtained hydraulically.

The foregoing object, and other, as also the features of the hydraulic equilibrium producing arrangement of my invention will be more readily understood from the following description of an illustrative embodiment thereof when read in conjunction with the appended drawing showing a simplified plan view thereof.

Referring to the drawing, the control hydraulic medium **1**, for example oil or any other appropriate liquid, presses on piston **2**. The force thereby imparted to piston **2** acting on one (the left) arm of lever **3** thus acts by way of the other (right) arm on the control element **4** which is a slide or sleeve valve, for example. Control element **4** is held in its open position, upwardly or downwardly, until such time as the force exerted by the working pressure on the working medium **5**, which may likewise be oil or any other appropriate liquid, acting on valve **4** is equal to the force exerted on such valve by lever **3**.

Valve **4** will thus be in a state of equilibrium and will remain in the position shown in the drawing. Hence the supply or feed pressure **6** must be greater, and the return pressure applied to the load generator **7** must be lower, than working pressure **5**. It follows that when the pressure obtaining in control medium **1** is changed, control element **4** is no longer in a condition of equilibrium and hence moves to an open position until a new working pressure in the load generator **5** restores the control element or valve to a condition of equilibrium.

When the ratio of the arms of lever **3** to each other is variable, for example, by making the lever pivot or fulcrum **8** variable in position, as shown in the drawing longitudinally along the lever, the force exerted on control element **4** may be varied. When this is done a new working pressure **5** will establish itself to restore control unit **4** to its equilibrium condition.

A plurality of the above described hydraulic load maintaining units of my invention may be connected in parallel, as indicated by supply lines **6'**, return lines **7'** and control lines **1'** and the elements connected thereto which are referred with the same reference numerals as in the above described unit to which a "prime" has been added in the drawing. So connected only one pump **9** for generating the supply pressure and one pump **10** for generating the control pressure are required.

What I claim is:

1. An arrangement of the character described comprising, in combination, a plurality of hydraulic working load generators; a single source of liquid under pressure; a plurality of pressure conduits respectively connecting said single source of liquid under pressure with said working load generators, respectively, for feeding liquid under pressure from said single source into the respective hydraulic working load generators; a drain conduit for each working load generator for discharging pressure liquid therefrom; valve means in each pressure conduit and the corresponding drain conduit and including a valve member movable from an equilibrium position, in which said valve member closes said pressure conduit and the corresponding drain conduit, in a first direction to a feed position connecting the respective pressure conduit with the respective working load generator, and movable from said equilibrium position in a second direction to a discharge position connecting the respective drain conduit with said working load generator; means for transmitting the fluid pressure in said working load generator to said valve member, said means being constructed and arranged so as to tend to move the latter in said second direction; and adjustable control means connected to said valve member and applying to the latter a force tending to move said valve member in said first direction, said control means comprising a single source of control fluid under pressure, a plurality of control cylinders, one for each valve member, and communicating with said single source of control fluid, a control piston in each control cylinder and subjected to the fluid pressure of said single source of control fluid, and transmisison means between each control piston and the corresponding valve member for transmitting the pressure exerted on said control piston to said valve member and including a lever tiltable about pivot means and engaged at points spaced from said pivot means by said control piston and said valve member, respectively, and means for changing the position of said tilting means relative to said points.

2. An arrangement as set forth in claim **1**, wherein said

lever is a double armed lever and said pivot means being located between said points.

3. An arrangement as set forth in claim 2, wherein said pivot means includes a roller engaging said lever and said means for changing the position of said pivot means include an elongated rod extending substantially parallel to said lever and means mounting said roller on said rod adjustable in longitudinal direction of the latter.

4. An arrangement as set forth in claim 1, wherein said valve means include a valve cylinder in which said valve member is slidably guided with one end thereof projecting beyond said valve cylinder and engaging said lever, and wherein said means for transmitting the fluid pressure in said working load generator to said valve member includes a conduit communicating at one end thereof with said work load generator and at the other end thereof with a portion of said valve cylinder.

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