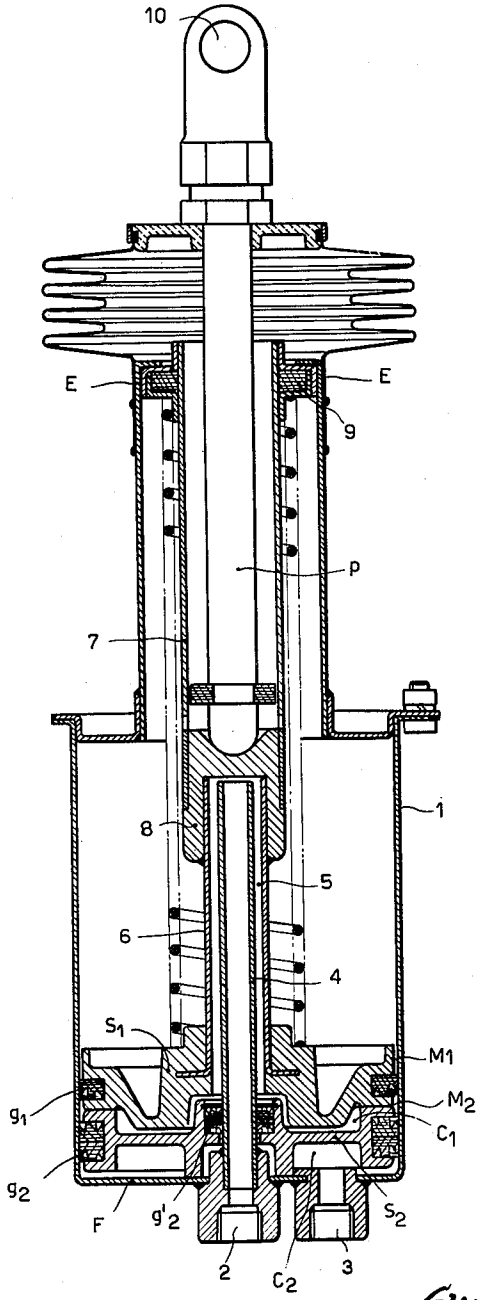
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FLUID ACTUATED CONTROL MECHANISM FOR A BRAKE AND SIMILAR APPARATUS

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FLUID ACTUATED CONTROL MECHANISM FOR A BRAKE AND SIMILAR APPARATUS

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This invention relates to dual action fluid pressure actuators for vehicle brakes and similar apparatus, of the type including a cylinder having two pistons axially slidable therein and forming two pressure chambers to provide for both service and emergency application of the brakes. More particularly, the invention is directed to an improved dual action fluid pressure actuator of this type.

In known dual action fluid pressure actuators of this type, the pistons have a very substantial axial length and thus occupy a good portion of the total length of the cylinder. To obtain the required actuating force with the thus relatively short available stroke, the diameters of the pistons and cylinders must be substantially increased. This increases the total area of contact between the cylinders and the pistons, requiring very accurate fitting of the parts for proper operation. In addition, the arrangements are bulky and cumbersome.

In accordance with the present invention, these disadvantages are overcome by reducing the axial length of the "service" and "emergency" pistons to the absolute minimum required to provide a proper seat for the piston packings or packing ring means. Guilding of the "emergency" or "auxiliary" piston is effected by arranging the same in guiding relation with a generally axial conduit forming part of the means for applying fluid pressure to the service piston during a service braking operation. In addition, the service piston is maintained in proper axial alignment in the cylinder by a generally axial tubular guiding element which is rigidly secured between the piston rod and the service piston.

For an understanding of the principles of the invention, reference is made to the following description of a typical embodiment thereof as illustrated in the accompanying drawing.

In the drawing, the single figure is an axial sectional view of a dual action fluid pressure actuator embodying the invention.

Referring to the drawing, the fluid pressure actuator of the invention includes a cylinder 1 in which are mounted, for axial sliding movement, a service piston S_1 and an emergency piston S_2. A service pressure fluid inlet nipple 2 and an emergency pressure fluid inlet nipple 3 are mounted through the end wall F of cylinder 1, nipple 2 being disposed substantially coaxially of the cylinder and nipple 3 being offset radially from nipple 2. A relatively small diameter tubular rod or conduit 4 has its outer end seated in and connected in fluid tight relation to the nipple 2, and is disposed, with annular clearance, through a relatively larger diameter tubular rod or conduit 6, the annular clearance or passage between conduits or rods 4 and 6 being indicated at 5.

A piston rod, including generally tubular sleeve 7, extends through the other end of the cylinder 1 and a plug or diaphragm is secured in fluid-tight relation in the inner end of sleeve 7. The conduit or tubular rod 6 is secured in fluid-tight relation in an axial recess in the end of plug or diaphragm 8, and the opposite end of tubular rod or conduit 6 is anchored, in fluid tight relation, in the central passage through the annular piston S_1. It will be noted that, in the inactive position of the parts shown in the drawing, the inner end of conduit 4, which is immovable relative to cylinder 1, terminates somewhat short of the inner end of conduit 6 and of the base of the recess in plug or diaphragm 8, to establish communication between the interior of conduit 4 and the annular space 5.

A push rod P has its inner end seated in a concave recess in the opposite end of the plug or diaphragm 8, and the outer end of push rod P is formed with an eye 10 for connection to the mechanism or apparatus to be actuated. A suitable packing 9 is disposed between the end wall of a reduced diameter extension from the cylinder 1 and the outer surface of tubular sleeve 7 of the piston rod.

It will be observed that the service piston S_1 and the emergency piston S_2 have a very short axial length, the combined axial length occupying only a small portion of the total axial length of the cylinder 1. The axially very short peripheries of the two annular pistons S_1 and S_2 are indicated at M_1 and M_2, and it will be noted that, in each case, the axial length is only just sufficient to provide a suitable seat for the packing rings g_1 and g_2 of the two annular pistons.

The service piston S_1, which is nearer to the piston rod 7, has its web deflected out of an axial plane and extending toward the web of the emergency piston S_1 to provide an abutment projecting axially beyond one end of the peripheral surface M_1. Nevertheless, the extent of the deflection of the web of annular piston S_1 is such that there is a clearance space between this web and the radially or diametrically extending web of the piston S_2. This clearance space forms a first pressure chamber C_1 for connection to a source of fluid under pressure for application of service fluid pressure. Further, the emergency piston S_2 has a central annular extension which extends outwardly toward end wall F a greater distance than does the rim portion M_2 of piston S_2 to abut the end wall F and maintain a clearance between the latter and the rim portion M_2 of the piston S_2.

The emergency application nipple 3 communicates with the second pressure chamber C_2 which is the working chamber for the emergency piston S_2. A fluid tight packing g'_2 is disposed between a second central annular extension extending inwardly from the web of annular piston S_2 and the tubular rod or conduit 4, this packing providing a guiding arrangement for the piston S_2 on the rod or conduit 4.

In operation, during a service application, a source of pressure fluid connected to the inlet 2 supplies pressure fluid to this inlet and thus to the conduit 4. The pressure fluid is applied from the conduit 4 through the annular space 5 to the first pressure chamber C_1 and acts to force the emergency piston S_2 toward the wall F and to force the service piston S_1 inwardly, thus moving the push rod P, and the eye 10, toward the right as viewed in the drawing. Upon release of the service pressure, the coil spring embracing the annular sleeve 7 of the piston rod and a hub on the service piston S_1 restores the parts to the position shown in the drawing. In an emergency application, pressure fluid, from a suitable source thereof, is applied to the nipple 3 and thus enters the second pressure chamber C_2. Initially, the effective area of piston S_2 which is exposed to this fluid pressure comprises only that annular portion of the web thereof which is disposed between the rim M_2 and the central annular extension. However, as the piston S_2 moves away from the wall F, substantially the entire surface of the piston S_2, except for that part occupied by the guiding tube or conduit 4, is subjected to the fluid pressure. The rims M_2 and M_1 are in abutment so that the inward movement of the emergency piston S_2 is transmitted to the service piston S_1 and thus to the piston rod 7 and the push rod P having the connection eye 10. Upon release of the emergency pressure, the aforemen-

tioned coil spring restores the parts to the position shown in the drawing.

It should further be noted that, by virtue of the annular clearance between the tube or conduit 4 and the service piston S_1, the service piston has a smaller surface area exposed to the fluid pressure in chamber C_1 than does the emergency piston S_2.

By the described arrangement, the total surface area of contact between the pistons and the cylinder is greatly reduced, particularly in an axial direction. Thus, the degree of accurate machining involved is also greatly reduced.

While a specific embodiment of the invention has been shown and described in detail in order to illustrate the application of the principles of the invention, it should be understood that the invention may be embodied otherwise without departing from such principles.

I claim:

1. A dual action fluid pressure actuator for brakes and similar apparatus, comprising, in combination, a relatively elongated cylinder; a first annular piston slidable axially in said cylinder, and having a relatively large diameter rim, a relatively smaller diameter hub, and a generally radially extending web interconnecting said rim and said hub; a piston rod extending through one end of said cylinder and having an outer end formed for connection to the apparatus to be actuated; a first tubular rod connected at one end to the inner end of said piston rod and having its opposite end connected to the inner end of said hub of said first piston and communicating with the opening through the latter; the outer end of the hub of said first piston having a substantially centrally axially extending annular recess therein, and the major portion of the outer surface of the web of said first piston being substantially flush with the outer end of the hub thereof; a second annular piston slidable axially in said cylinder and disposed between said first piston and the opposite end of said cylinder said second piston having a relatively large diameter rim equal in diameter to the rim of said first cylinder, a relatively small diameter hub having a diameter smaller than that of the hub of said first piston, and a substantially uniplanar radial web interconnecting the rim and the hub thereof; said hub including an inner annular portion arranged to seat in the recess in the hub of said first piston, with clearance between the outer end of said annular portion and the base of the recess, and with clearance between the webs of said pistons, and having an axially outer annular projection extending outwardly from said web and arranged to engage the cylinder end wall to space the web of said second piston from said end wall; a second tubular rod, of smaller diameter than said first tubular rod, having a fixed end opening through said opposite end of said cylinder, said second tubular rod extending through said pistons and said first

tubular rod and communicating, at its inner end, with the annular space between said first and second tubular rods; said second piston having fluidtight guiding engagement with said second tubular rod; means biasing both said pistons toward said opposite end of said cylinder, the axial clearance between the hubs and webs of said pistons forming a first pressure chamber between the facing surfaces of said pistons and communicating with said first tubular rod; a first pressure fluid inlet nipple connected to the outer end of said second tubular rod for application of fluid pressure to said first pressure chamber to move said first piston and said piston rod away from said opposite end wall of said cylinder; the axial clearance between the web of said second piston and the end wall of said cylinder, provided by engagement of said outer annular projection of said second cylinder with said end wall, forming a second pressure chamber between the outer face of said second piston and said opposite end wall; and a second pressure fluid inlet nipple in said opposite end wall communicating with said second pressure chamber for application of fluid pressure thereto to move both said pistons away from said opposite end wall.

2. A dual action fluid pressure actuator as claimed in claim 1, in which said first inlet nipple is mounted through said end wall of said cylinder substantially centrally thereof and has said second tubular conduit seated therein; said second inlet nipple being mounted through said end wall radially outwardly of said first inlet nipple.

3. A dual action fluid pressure actuator as claimed in claim 1, said first piston having a periphery abutting the periphery of said second piston and a web portion offset toward the web of said second piston but spaced therefrom to define therewith said first pressure chamber.

4. A dual action fluid pressure actuator as claimed in claim 1, said piston rod includinug a plug having an axial recess in which said one end of said first tubular rod is seated and secured and into which the inner end of said second tubular rod partially extends, a tubular sleeve embracing said plug and extending through such one end of said cylinder, and a push rod seated in a recess in the other end of said plug and having its outer end formed for such connection to the apparatus to be actuated.

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