

July 23, 1940.

C. F. BAISCH

2,208,620

PACKING FOR HYDRAULIC ACTUATORS

Filed July 21, 1937

2 Sheets-Sheet 1

FIG. 1.

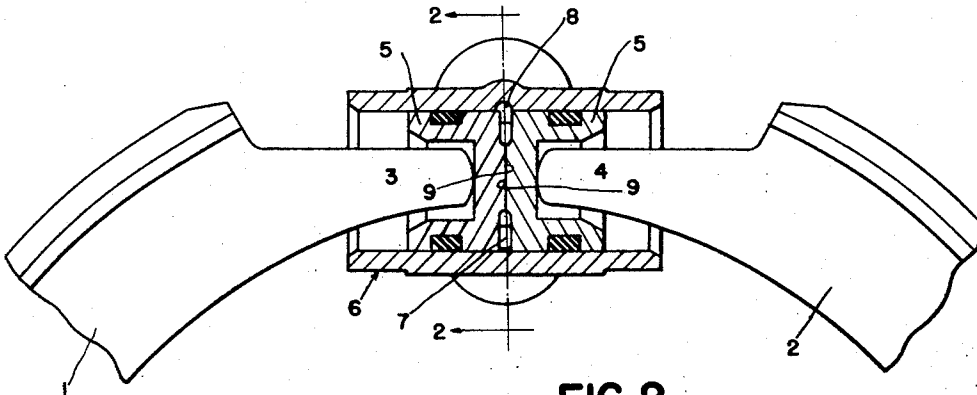


FIG. 2.

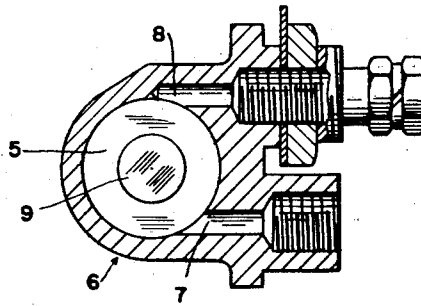


FIG. 3.

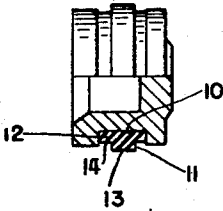


FIG. 4.

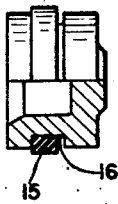


FIG. 5.

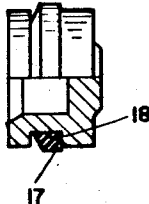
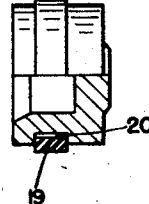


FIG. 6.



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FIG. 7.

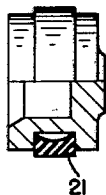


FIG. 8.

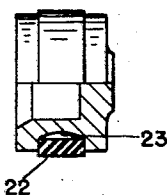


FIG. 9.

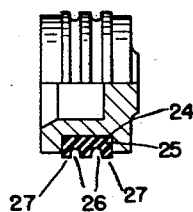


FIG. 10. FIG. 11.

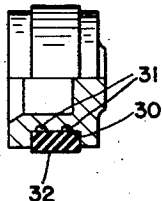
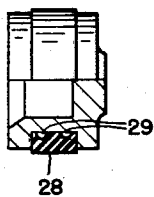


FIG. 12.

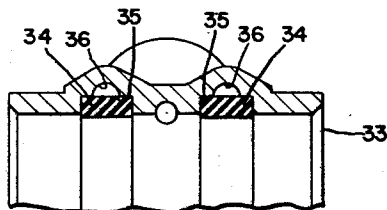


FIG. 14.

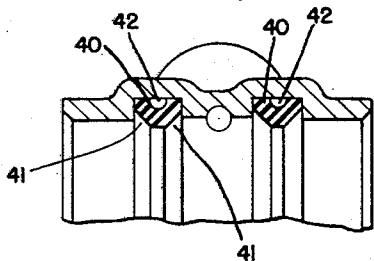


FIG. 13.

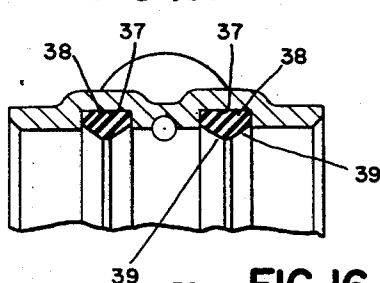


FIG. 15.

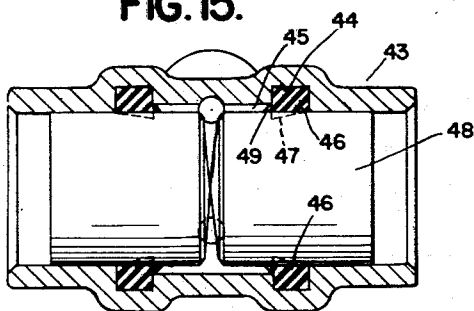
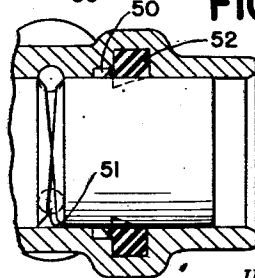


FIG. 16.



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PACKING FOR HYDRAULIC ACTUATORS

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a corporation of Delaware

Application July 21, 1937, Serial No. 154,914

6 Claims. (Cl. 286—1)

The invention relates to hydraulic actuators and refers more particularly to hydraulic devices for actuating brakes of motor vehicles.

The invention has for one of its objects to provide a hydraulic actuator having a simply constructed seal between the cylinder and the piston, which seal effectively prevents the escape of liquid between the two members. The invention has for another object to form the cylinder or the piston with an annular groove opening toward the other and adapted to receive the packing ring, either the groove or the packing ring being in free state of generally rectangular cross section with substantially parallel walls at its ends and the other being in free state of modified cross section, the construction being such that upon assembly the ring is subjected to distortion and displaced to conform substantially to the groove and to closely engage the cylinder and piston. The invention has for further objects the novel combinations and arrangements of parts, or organizations, as more fully hereinafter set forth.

In the drawings:

Figure 1 is a sectional elevation of a hydraulic actuator showing an embodiment of my invention;

Figure 2 is a cross section on the line 2—2 of Figure 1;

Figure 3 is a sectional elevation of a portion of Figure 1 showing the packing ring applied to the piston and in free state or normal condition;

Figures 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 and 14 are views similar to Figure 3 showing other modifications;

Figures 15 and 16 are views similar to Figure 1 showing other modifications.

The hydraulic actuator, as illustrated in this present instance, is adapted to actuate a brake of a motor vehicle. The actuator is located at the brake end of the hydraulic system and is commonly known as a wheel cylinder. It is adapted to be suitably mounted upon a bracket or backing plate in the usual manner and to be located so as to actuate either or both operating ends of a brake device, which may also be of usual construction. As illustrated, the braking device comprises the brake shoes 1 and 2, the operating ends of which terminate in the projections or arms 3 and 4 respectively which extend toward each other and which are engaged by the pistons 5 of the wheel cylinder. These pistons are slidable within the cylinder 6 which is provided preferably midway of its length and at its bottom and top with the passageways 7

and 8 respectively. The passageway 7 provides for the passage of the braking liquid to and from the cylinder between the pistons, while the passageway 8 is a bleed passageway providing for the escape of air from the cylinder when initially filling or replenishing the system with the braking liquid. The pistons, as illustrated in Figure 1, have their central portions 9 of their pressure end faces extending axially or longitudinally of the pistons toward each other and adapted in the retracted positions of the pistons to extend closely adjacent to each other, the surrounding portions of the pressure end faces being spaced to provide clearance between the pistons in the zones of the passageways 7 and 8. To provide an effective seal between the pistons and the cylinders to prevent the escape of the braking liquid, I have provided packing rings which may be carried by either the pistons or the cylinders.

As illustrated in Figures 1, 2 and 3, the packing rings are carried by the pistons, each of which latter is formed with the annular groove 10 which is of generally rectangular cross section with substantially parallel walls at its ends. More specifically, the groove has a cylindrical bottom wall and parallel side walls extending at right angles to the bottom wall. The groove opens toward the cylinder 6 and is filled, or at least substantially filled, by the packing ring 11, which is formed of a material which is non-compressible, or at least non-compressible to the same extent as liquid. The material is preferably rubber, which may be either organic or synthetic. The ring normally or in its free state has a cross section modified with respect to that of the groove. The ring normally has a radial extent greater than that of the groove and comprises the portion 12 having its inner diameter preferably equal to the diameter of the bottom of the groove and the radially outwardly extending portion 13 which extends beyond the groove and is provided with the axially spaced substantially right angled wiping corners 14. The outer diameter of the portion 12 is preferably slightly less than the outer diameter of the groove and the mass or volume of the portion 13 is larger than the unoccupied portion of the groove by the amount of clearance between the piston 5 and the cylinder 6 for the approximate width of the ring. As a result, when the piston with the ring in place is assembled with the cylinder, the ring is subjected to distortion and displaced to conform substantially to the groove and to assume a substantially solid cross section of generally rectangular shape, at which time

the ring firmly engages both the piston and the cylinder and serves as an effective seal to prevent leakage of the braking liquid between the piston and the cylinder. It will thus be seen that the ring is preloaded in the assembly and therefore under compression, which tends to return the ring to its free shape. As a result, stresses in the ring set up by reason of its preloaded shape serve effectively in sealing against leakage, both when the hydraulic actuator is at rest and in operation, and also that these stresses are assisted by the liquid pressure to even more effectively seal against leakage when the system is in operation. It will also be noted that the wiping corners of the ring, which tend to maintain their shape, serve in operation to wipe back the braking liquid.

Figure 4 discloses a modification of Figure 3, in which the packing ring 15 normally has a rectangular cross section different from that of the annular groove 16 in that the width of the packing ring is less. However, the radial extent of the packing ring is greater than that of the groove and such that when the piston and ring assembly is assembled with the cylinder, the ring is subjected to distortion and displaced to completely fill the groove and to firmly engage both the piston and the cylinder.

In the modification illustrated in Figure 5, the packing ring 17 differs essentially from the packing ring 15 of Figure 4 in that it normally has a beveled end and the width of its inner face is substantially equal to the width of the groove 16. The construction, however, is such that when the parts are assembled, the packing ring fills the groove and firmly engages both the piston and the cylinder.

As disclosed in Figure 6, the packing ring 19 has a rectangular cross section the width of which is substantially the same as that of the groove 20. However, the normal internal diameter of the packing ring is greater than the diameter of the bottom of the groove to provide a clearance therebetween. Upon assembly of the piston and ring assembly with the cylinder, the ring will be deformed to completely fill the groove and to closely engage the piston and the cylinder.

The modification shown in Figure 7 differs from that of Figure 6 principally in forming the inner face of the packing ring 21 so that it is transversely concave and has an annular groove in its normal state.

Figure 8 shows another modification in which the packing ring 22 has a rectangular cross section and the bottom of the groove 23 is made transversely concave throughout its entire extent.

In the modification illustrated in Figure 9, the groove 24 has a rectangular cross section and is engaged by the packing ring 25 which is also of a general rectangular cross section. However, the outer face of this ring is provided with the pair of annular grooves 26 in its normal state. Each of the grooves provide an extra pair of wiping corners 27. These additional wiping corners serve in the assembly to more effectively prevent leakage of the braking liquid between the piston and the cylinder. However, it will be noted that in the assembly, the packing ring has, in effect, a solid rectangular cross section, the material forming the outer portion of the ring having been deformed during the assembly.

Figure 10 discloses a modification which differs essentially from that of Figure 9 in that the inner face of the packing ring 28 in its normal

state is provided with the pair of annular grooves 29 which in the assembly are filled or substantially filled by the material of the packing ring.

In the modification illustrated in Figure 11, the bottom of the groove 30 is formed with the annular grooves 31 into which the material of the packing ring 32 is deformed when the piston with the ring in place is assembled in the cylinder.

Figure 12 shows the cylinder 33 of the hydraulic actuator formed with grooves for receiving the packing rings designed to cooperate with the pistons to prevent leakage of the braking liquid between the pistons and the cylinder. In this modification, each packing ring 34 has a rectangular cross section and the bottom of each groove 35 has the annular groove 36 into which the packing ring is deformed when the associated piston is inserted into place.

The modification illustrated in Figure 13 differs from that illustrated in Figure 12 first, in forming each annular groove 37 with a rectangular cross section, and second, in forming each packing ring 38 to normally have its inner side with the inclined portions 39 converging toward, but terminating short of each other. The mass or volume of each packing ring is such that when the associated piston is inserted into place, the packing ring is subjected to distortion and deformed to fill the groove and to closely engage the cylinder and the piston.

The modification illustrated in Figure 14 differs essentially from that illustrated in Figure 13 in that each packing ring 40 in its normal state, in addition to having inclined inner portions 41 converging toward and terminating short of each other, has in its outer face the annular groove 42. However, in the complete assembly, the groove in the cylinder and also the groove in the packing ring are substantially filled and the packing ring resiliently closely engages both the cylinder and the piston.

Figure 15 discloses another modification in which the cylinder 43 in the present instance is formed with the annular groove 44 of substantially rectangular cross section and also with the annular groove 45 of considerably less depth than the groove 44. The groove 45 opens into the inner or pressure end of the groove 44 and also into a corresponding groove symmetrically disposed in the cylinder with respect to its transverse median plane. 46 is the annular packing ring formed of the same material as that of the above described rings and normally having a cross section with an inner side tapered radially and axially inwardly of the cylinder, as shown by the dotted line 47. This ring upon assembly of the piston 48 with the cylinder is deformed and its excess material is displaced into the annular groove 45 to form the annular lip 49. The lip forms a reserve of material under compression to insure the annular groove 44 being completely filled at all times and the contact between the ring and the cylinder and the piston being constantly maintained.

The modification illustrated in Figure 16 differs from that of Figure 15 mainly in forming the annular groove 50 to terminate short of the zone of the cylinder having the port 51 through which the braking fluid passes to and from the cylinder. The normal and operative shapes of the packing ring 52 is the same as those of the ring 44.

What I claim as my invention is:

1. In a hydraulic actuator, a cylinder, a piston within said cylinder, one of said members having

an annular groove of generally rectangular cross section with substantially parallel side walls opening toward the other of said members, and a packing ring within said groove, said ring being non-compressible and when initially assembled with said grooved member having a portion substantially filling the bottom of said groove and a portion extending beyond said groove provided with wiping corners spaced from its ends and each other, said ring upon assembly of said cylinder and piston being subjected to distortion and the portion of said ring extending beyond said groove being displaced axially to assume a substantially solid generally rectangular cross section and to closely engage said cylinder and piston.

2. In a hydraulic actuator, a cylinder, a piston within said cylinder, one of said members having an annular groove of generally rectangular cross section with substantially parallel side walls opening toward the other of said members, and a packing ring within said groove, said ring being non-compressible and when initially assembled with said grooved member having a portion within said groove and a portion extending from said first mentioned portion and beyond said groove and provided with wiping corners within the confines of the extended side walls of said groove, said corners being spaced from each other a distance less than half the width of said groove, said ring upon assembly of said cylinder and piston being subjected to distortion and displaced to assume a substantially solid generally rectangular cross section and to closely engage said cylinder and piston.

3. In a hydraulic actuator, a cylinder, a piston within said cylinder, one of said members having an annular groove of generally rectangular cross section with substantially parallel side walls opening toward the other of said members, and a packing ring within said groove, said ring being non-compressible and when initially assembled with said grooved member having a portion extending beyond said groove provided with wiping corners spaced from each other a distance less than the distance from said corners to the side walls of the groove, said ring upon assembly of said cylinder and piston being displaced and closely engaging said cylinder and piston.

4. In a hydraulic actuator, a cylinder, a piston within said cylinder, one of said members having an annular groove of generally rectangular cross section with substantially parallel side walls opening toward the other of said members, and a packing ring within said groove, said ring being non-compressible and when initially assembled with said grooved member having a portion of reduced width extending from within said groove to a point beyond said groove and provided with spaced wiping corners and an annular recess adjacent the bottom of said groove, said ring upon assembly of said cylinder and piston being subjected to distortion and displaced to assume a substantially solid generally rectangular cross section and to closely engage said cylinder and piston.

5. In a hydraulic actuator, a cylinder, a piston within said cylinder, one of said members having an annular groove of generally rectangular cross section with substantially parallel side walls opening toward the other of said members, and a packing ring within said groove, said ring being non-compressible and in its free state having parallel side walls engaging the side walls of said groove and terminating a predetermined distance inwardly from the outer edge of said groove and a portion of reduced width extending beyond the outer edge of said groove.

6. In a hydraulic actuator, a cylinder, a piston within said cylinder, one of said members having an annular groove of generally rectangular cross section with substantially parallel side walls opening toward the other of said members, and a non-compressible packing ring within said groove having in its free state parallel side walls engaging the opposite side walls of the groove, the side walls of said ring converging toward each other from a point spaced inwardly a predetermined distance from the outer edge of the groove and terminating a predetermined distance beyond the outer edge of said groove and short of each other to form spaced wiping corners, said ring upon assembly of said cylinder and piston being displaced to conform substantially to said groove and to assume a solid cross section closely engaging said cylinder and piston.

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