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FLUID PRESSURE PRODUCING DEVICE

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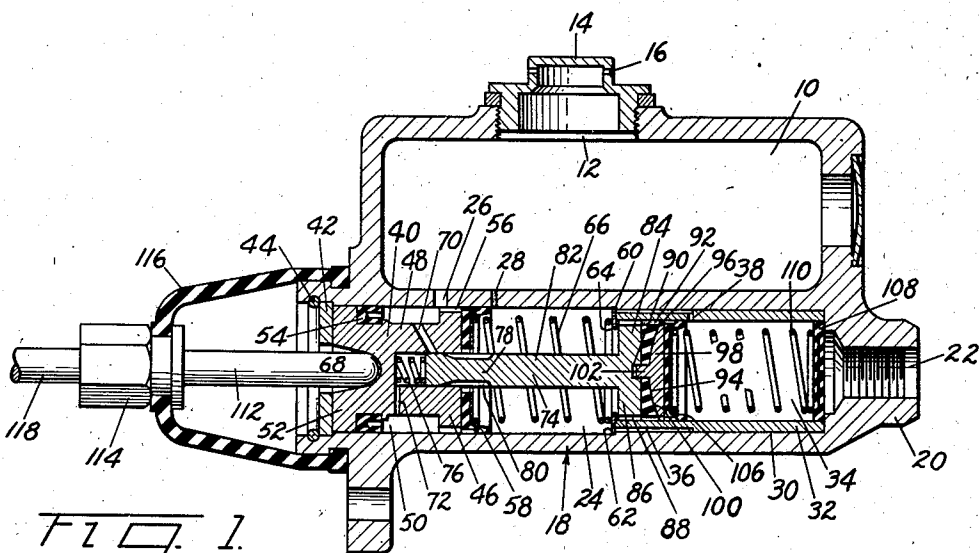


FIG. 1.

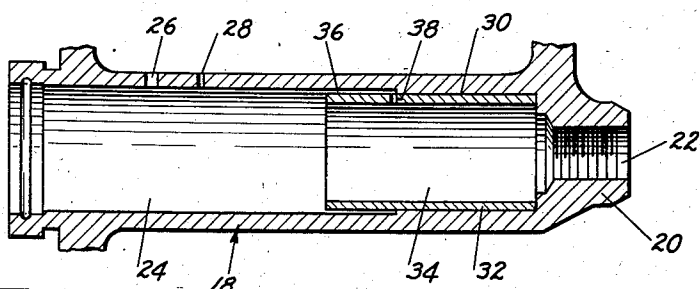


FIG. 2.

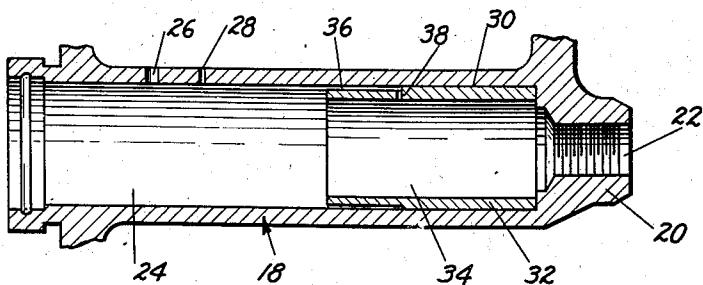


FIG. 3.

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FLUID PRESSURE PRODUCING DEVICE

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Original application March 7, 1940, Serial No. 322,790. Divided and this application January 10, 1941, Serial No. 374,004

5 Claims. (Cl. 60—54.6)

This invention relates to master cylinders for hydraulic brake systems and more particularly to a compound cylinder and a method of manufacture thereof.

This application is a division of my pending application, Serial No. 322,790, filed March 7, 1940, and is made in accordance with the United States Patent Office Rule No. 42.

Broadly the invention comprehends a fluid pressure producing device of the two phase type of construction and the invention is designed to standardize production and to reduce the cost of manufacture of such device.

An object of the invention is to provide a compound cylinder formed of component parts.

Another object of the invention is to provide a double diametral cylinder including component parts thereof, and a method of assembly of the parts.

Another object of the invention is the provision of a cylindrical sleeve adapted to be inserted in the cylinder of a conventional fluid pressure producing device and thereby provide a cylinder having double diametral bores.

Other objects and advantages of the invention will appear from the following description taken in connection with the accompanying drawing forming a part of this specification, and in which—

Fig. 1 is a sectional view of a compound master cylinder embodying the invention;

Fig. 2 is an enlarged sectional view illustrating a slightly modified embodiment of the compound cylinder;

Fig. 3 is a sectional view illustrating a further modification of the compound cylinder.

Referring to the drawing for more specific details of the invention, a single casting includes a reservoir 10, having a filling opening 12 normally closed by a head 14 having openings 16 therethrough for venting the reservoir to the atmosphere, and a cylinder 18 at the base of the reservoir having one of its ends closed as by a head 20 provided with a discharge port 22, and its other end open.

In the open end of the cylinder is a chamber 24 of standard gauge, bearingized, and provided with spaced ports 26 and 28 affording communication between the chamber 24 and the reservoir 10. The cylinder 18 also has a bore 30, preferably of slightly less diameter than the chamber 24 arranged forward of, concentric to, and in direct communication with the chamber 24 and also with the discharge port 22.

A cylinder section 32 fitted tightly and sealed

in the bore 30 has a bearingized chamber 34 and a circumferentially reduced portion providing in conjunction with the wall defining the bore 30, an annular passage 36 communicating with the chamber 24, and a port 38 arranged in the wall of the cylinder 32 providing a communication between the chamber 34 and the annular passage 36. It is also proposed to construct the cylinder section 32 as a separate unit having a uniform circumference and overall length complementary to the bore 30, and a chamber 34 which may be of any one of several gauges so that any desired differential in the gauge of the chamber 24 and that of the chamber 34 may be had. This cylinder section 32 may be secured in the bore 30 by a press fit, as illustrated in Figs. 1 and 2, or the cylinder may be heated and the cylinder section 32 chilled and then assembled as shown in Fig. 3.

In order to standardize production and thereby reduce cost in the manufacture of fluid pressure producing devices of this type, it is the purpose of the instant invention to construct the reservoir 10 and the cylinder 18 as a single unit. The cylinder has a standard gauge chamber 24 and a bore 30 of uniform size forward of the chamber. The bore 30 may be of less diameter than the chamber 24, as shown in Figs. 1 and 2, or of the same gauge as illustrated in Fig. 3.

In Fig. 1 the bore 30 is of reduced diameter as compared with the chamber 24, and the cylinder section 32 has a length equal to the length of the reduced bore 30. This cylinder section is fitted tightly in the bore 30 with an end portion of reduced external diameter providing in conjunction with the immediately surrounding wall of the bore 30, an annular passage 36 communicating through port 38 through the wall of the cylinder section with the chamber 34 within the interior of the cylinder section.

In Fig. 2 the reduced diameter bore 30 of the master cylinder has a length less than the length of the cylinder section 32. The cylinder section is fitted tightly within this reduced diameter bore and is of uniform external diameter throughout its length. The passage 36, which corresponds to the passage 36 in Fig. 1, is formed between the end portion of the cylinder section 32 and the immediately surrounding wall of chamber 24 of the master cylinder.

In Fig. 3 the master cylinder is of uniform internal diameter throughout its length and the cylinder section 32 is of the construction shown in Fig. 1 being provided with an end portion of reduced external diameter. Between this re-

duced diameter portion and the immediately surrounding wall of the master cylinder is provided passage 36 which corresponds to the similarly numbered passage described in connection with the structures of Figs. 1 and 2.

Each of these modifications is characterized as follows:

The master cylinder is provided adjacent to its open end with a chamber 24 and adjacent to its closed end with a chamber 34 and the chamber 34 is of reduced diameter as compared with chamber 24. Chamber 34 of reduced diameter is formed by the cylinder section 32 which is fitted tightly within the master cylinder adjacent to its closed end. The chamber 34 communicates with the chamber 24 through a port 38 through the wall of the cylinder section 32, and the annular passage between a circumferential portion of section 32 and the immediately surrounding wall of the master cylinder.

A piston 40 reciprocable in the chamber 24 is retained against displacement by a washer 42 seated on the annular shoulder in the open end of the cylinder 18 and held in place by a retaining ring 44 seated in a groove in the wall of the cylinder. The piston 40 includes a head 46, a body 48 having a reduced diameter providing in conjunction with the wall of the cylinder 18 an annular chamber 50 communicating with the reservoir 10 as by way of the port 26, and a skirt 52 supporting a sealing cup 54 for inhibiting seepage of fluid from the annular chamber 50 past the piston. The head 46 has a plurality of spaced passages 56 therethrough providing communications between the annular chamber 50 and that portion of the chamber 24 forward of the piston, and a sealing cup 58 seated on the head 46 of the piston controls the passages 56.

A washer 60 seated on the end of the cylinder 32 opposite the piston 40 has in its periphery a plurality of spaced notches 62 for the passage of fluid between the chamber 24 and the annular chamber 36, and also a plurality of spaced lands 64 preferably stamped or embossed in the body of the washer, and a spring 66 interposed between the sealing cup 58 and the washer 60 serves to retain the cup and washer against displacement and also to assist in return of the piston 40 to its retracted position.

The piston 40 has disposed concentrically in its body 48 a valve chamber 68 opening through the head of the piston. This valve chamber has a port 70 providing a communication between the valve chamber and the annular chamber 50 and also a vent 72 opening from adjacent the bottom of the valve chamber into the annular chamber 50 for inhibiting fluid lock. A valve 74 slidable in the valve chamber abuts a compression spring 76 of high elasticity seated on the bottom of the valve chamber.

The valve includes a cylindrical body 78 fitted snugly for reciprocation in the valve chamber. This cylindrical body has a peripheral groove or slot 80 adapted to register with the port 70 in the valve chamber so as to provide for passage of fluid from the chamber 24 through the valve and into the annular chamber 50. The groove or slot 80 is preferably tapered or calibrated so that fluid may be metered gradually from the chamber 24 through the valve into the annular passage 50.

The valve 74 has a stem 82 formed integral with a piston 84 reciprocable in the chamber 34. The piston normally seats on the lands 64 of the washer 60. It is essential that this pis-

ton be of such structure as to withstand high pressures without seepage of fluid past the piston and also without injury to the component parts of the piston.

As shown, the piston 84 includes a head 86 having a plurality of passages 88 therethrough providing communications between the chambers 24 and 34, and a concentrically disposed shallow bore 90. A rubber washer 92 seated on the head 86 of the piston has a concentric opening therethrough registering with the shallow bore 90. This washer is preferably constructed from rubber having a high durometer reading. The diameter of the washer is slightly less than the gauge of the chamber 34, so that fluid may bypass the washer when it is not under pressure. The washer 92 has a concaved face 94, and this concaved face in conjunction with the perimeter of the washer provides a pronounced lip 96. A spacer or pressure block 98 seated on the concaved face of the washer has a convex face 100 complementary to the concaved face of the washer. The pressure block 98 has an extension 102 concentrically disposed on its convex face, and this extension is received by the opening in the washer and also by the bore 90 in the head of the piston with small clearance between the bottom of the bore and the free end of the extension 102, so as to limit the compressibility of the washer and thus avoid binding of the washer in the chamber 34.

The pressure block 98 has a plurality of spaced passages 104 therethrough controlled as by a sealing cup 106 seated on the pressure block. High pressure imposed on the sealing cup 106 is transmitted through the pressure block 98 to the washer 60. This results in radial expansion of the washer, and because of the particular contour thereof the lip 96, when the washer is deformed under pressure, engages the wall of the chamber 34 with substantial bearing surface.

A two-way valve 108 seated on the head of the cylinder 18 within the chamber 34 controls the discharge port 22, and a spring 110 interposed between the sealing cup 106 and the two-way valve 108 serves to retain the cup and valve against displacement and also to return the pistons 40 and 84 to their retracted positions. The spring 110 is of high elasticity, and is preferably balanced with the spring 76 in the valve chamber.

A thrust pin 112 has one of its ends seated in a socket in the back of the piston 40, and on the other end of the thrust pin is a coupling 114 connected by a flexible boot 116 to the open end of the cylinder 18 for the exclusion of dust and other foreign substances. A rod 118 has one of its ends connected to the coupling 114 and its other end pivotally connected to a foot pedal lever not shown.

While this invention has been described in connection with certain specific embodiments, the principle involved is susceptible of numerous other applications that will readily occur to persons skilled in the art. The invention is, therefore, to be limited only as indicated by the scope of the appended claims.

I claim:

1. A master cylinder having a closed end provided with a bore and an open end, a cylinder section fitted tightly therein adjacent to the closed end providing a chamber at such end of reduced diameter as compared with the chamber adjacent to the open end, said cylinder section having a circumferential portion at its end which

is remote from the closed end of the master cylinder spaced from the immediately surrounding wall of the master cylinder and forming therewith an annular passage communicating with the chamber adjacent to the open end of the master cylinder, said cylinder section having a port establishing communication between said annular passage and the interior of the cylinder section.

2. A master cylinder having a closed end provided with a bore and an open end, a cylinder section fitted tightly therein adjacent to the closed end providing a chamber at such end of reduced diameter as compared with the chamber adjacent to the open end, said cylinder section having a circumferential portion of reduced diameter spaced from the immediately surrounding wall of the master cylinder forming an annular passage communicating with the chamber adjacent to the open end of the master cylinder, said cylinder section having a port establishing communication between said annular passage and the interior of the cylinder section.

3. A device of the class described comprising a cylinder having a closed end provided with a port and an open end, said cylinder having a stepped bore and a cylinder section squeezed in

the smaller bore, said cylinder section having a port providing communication between the larger bore and the cylinder section.

4. A device of the class described comprising a reservoir, a cylinder at the base thereof having a closed end provided with a discharge port and an open end, a chamber in the open end communicating with the reservoir, a chamber of relatively less diameter in the closed end and a cylinder section squeezed in the small chamber providing in conjunction with the wall of the cylinder an annular passage communicating with the large chamber and a port in the body portion of the cylinder section providing a communication between the annular passage and the cylinder section.

5. A device of the class described comprising a cylinder having axially disposed concentric bores, the large bore defining a chamber, and a cylinder section in the small bore extended partially into the large bore to provide in conjunction therewith an annular passage, said cylinder section defining a chamber of smaller diameter than the chamber in the large bore and having a port of its wall providing communication between the chambers by way of the annular passage.

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