June 2, 1942. M. L. MASTELLER 2,284,669

HYDRAULIC BRAKE

Filed Dec. 17, 1938

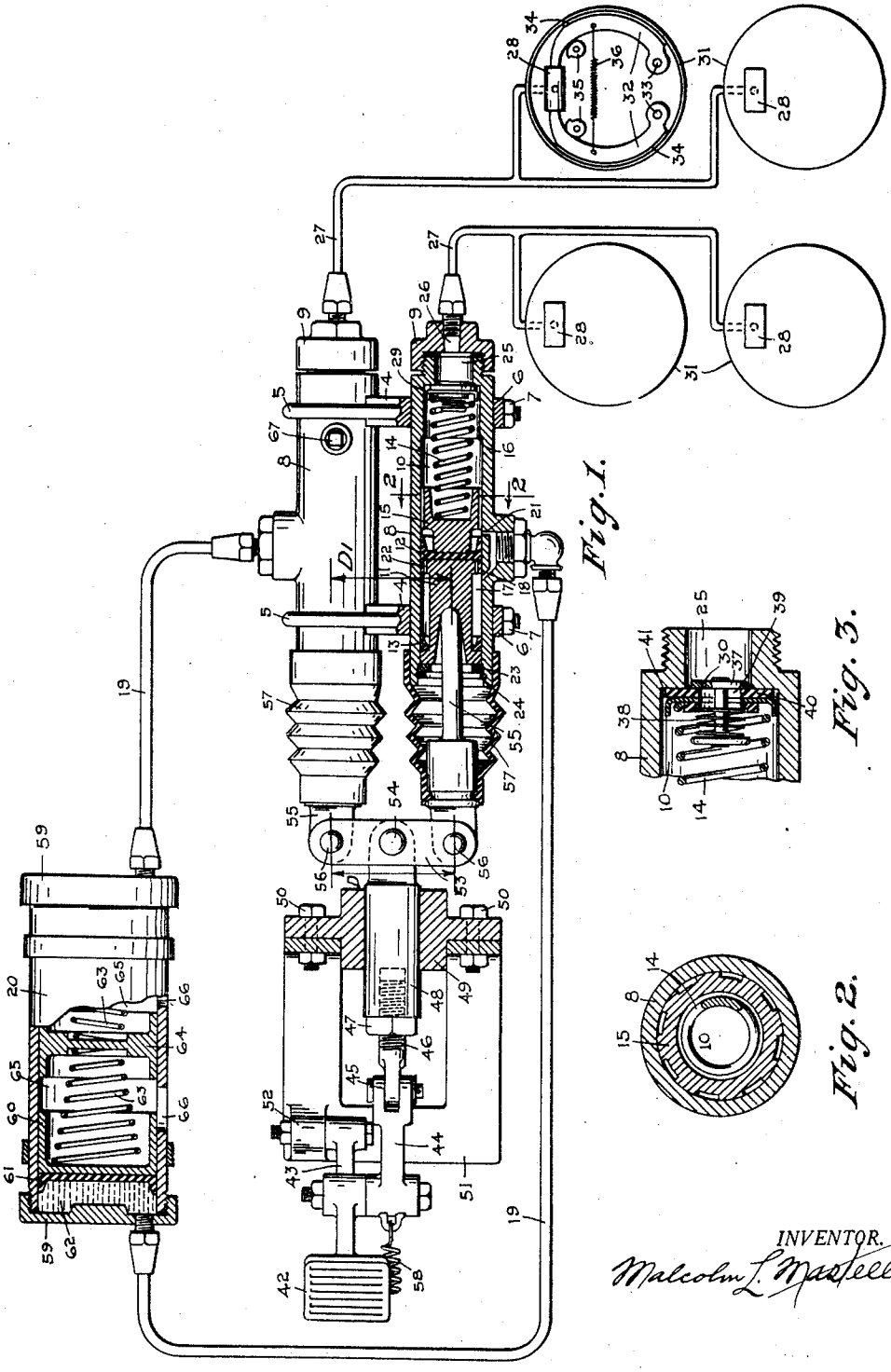

Fig. 1.

Fig. 3.

Fig. 2.

INVENTOR.

Malcolm L. Masteller

Patented June 2, 1942 2,284,669

UNITED STATES PATENT OFFICE

2,284,669

HYDRAULIC BRAKE

Malcolm L. Masteller, Miami, Fla.

Application December 17, 1938, Serial No. 246,395

4 Claims. (Cl. 60—54.6)

This invention relates to improvements in hydraulic braking apparatus in which dual hydraulic systems co-operate, and the principal object of the improvements is to provide means for the operation of said dual hydraulic systems having the effect of imparting a predetermined proportion of the braking power through each of them, in such manner that in the event of failure of one of the units of said dual hydraulic systems, the power ratio effective through the remaining one will remain unaffected by said failure.

Other objects will also be apparent to one skilled in the art.

I attain these objects by mechanism illustrated in the accompanying drawing, in which—

Figure 1 is a top plan view of dual master cylinders, shown partly in horizontal section and partly in elevation, also of other parts shown in section and diagram.

Figure 2 is a cross section of cylinder and its interior parts, taken on line 2—2 of Figure 1.

Figure 3 is an enlarged sectional detail of the double-acting check-valve and by-pass.

Similar numerals refer to similar parts throughout the several views.

Referring to the drawing, the master cylinder assembly comprises dual identical compressors, mounted side by side, upon bracket 4 by means of U bolts 5, cross members 6 and nuts 7; the description of each of them being as follows: a casing 8; detachable head 9; a compression chamber 10 housed within said casing; compressor piston 11, together with its primary packing cup 12 and secondary packing cup 13; compression spring 14, urging said compressor piston to its normal or off-brakes position as illustrated, and also constituting the actuating means of a pumping device hereinafter described; stop member 15, actuated in conjunction with said compressor piston and designed to engage annular shoulder 16, formed in the casing wall, thereby limiting the range of said compressor piston to approximately the length of the range of the actuating means hereinafter described, said stop member having axial fluting around its circumference to permit the free passage of liquid and also of any air which may be present, it is also chambered to accommodate spring 14; annular compartment 17, formed between said compressor piston and the casing wall, said annular compartment, hereinafter called the inlet vestibule, having an inlet passage 18 from pipe line 19 which associates it with the reservoir 20 hereinafter described; by-pass 21; passages 22 through the head of said compressor piston; backing plate washer 23, held against an annular shoulder in said casing by retaining spring 24 which in turn is held in an annular recess in said casing by its own resilience; outlet vestibule 25, having an outlet passage 26 to the pipe line 27 leading to a brake actuating motor 28 at each wheel of a given pair, as diagrammatically illustrated; said pipe line 27 together with its outlet vestibule 25 and passage 26 being hereinafter called the wheel line; a two way check-valve generally referred to, as shown in Figure 1, by the reference 29, and hereinafter described in detail, as shown in the enlarged Figure 3, separating said compression chamber and said wheel line and regulating the flow of liquid between them; a minute by-pass 30 (see Fig. 3) associating said compression chamber and said wheel line for normally permitting an equilibrium of the liquid throughout the hydraulic system; said by-pass 30 being covered by my copending application Serial No. 356,808, filed Sept. 14, 1940.

The brake itself may be of any conventional design, preferably as diagrammatically illustrated in Figure 1, in which it comprises drum 31, a pair of shoes 32 pivotally mounted at 33 and provided with frictional linings 34, adjustable rests 35 and extension spring 36.

Said two way check valve 29 is well known in the art and requires but a brief description, see Figure 3. It is made up of a check-valve within a check-valve, the inner one having check member 37, with its compression spring 38, disposed to open and close a central passage 39 and permit a free flow of liquid under pressure from compression chamber 10 to the wheel line and prevent its return through said central passage; the outer one having check member 40 seated upon a shoulder 41 formed in said casing wall, and normally held there by compression spring 14 in such manner as to restrict the return flow of liquid from the wheel line to the compression chamber. Such is the two way check-valve as commonly used. In the present invention, as above stated, there is also the minute by-pass 30 which in this form of the invention is disposed through check member 37.

The above-mentioned pumping device includes casing 8; chamber 10; piston 11, together with its primary packing cup 12 and secondary packing cup 13, and passages 22; compression spring 14; and said two way check-valve. Said passages 22 and packing cup 12 constitute the inlet valve of said pump, and said two way check-valve assem-

bly constitutes an outlet valve, and a return valve for admitting the liquid from the wheel line into the compression chamber after the pumping action in prearranged degree has taken place.

The dual compressor pistons 11 have a common actuating means comprising the pedal 42, conveniently attached to crank 43; link 44, hinged at 45 to adjusting bolt 46 having screw-threaded engagement, and lock nut 47, with plunger 48, mounted in its guide member 49 which is attached by means of screw bolts 50 to bracket 51, common to both said guide member and the fulcrum 52 of said crank, swingletree 53 pivotally attached as at 54 to said plunger; piston rods 55, hinged, as at 56, to said swingletree; boot 57; and extension spring 58 adapted to retract said actuating means.

Swingletree 53 has a length enabling the centers of pins 56 to be slightly farther apart than the centers of pistons 11 in order that the maximum rotation of said swingletree may not throw said piston rods unduly out of line in relation to said pistons. These distances are represented respectively by the arrows D and D1.

The reservoir 20 is of the duplex equalizing compensating type more fully described in my co-pending application Serial Number 104,851 filed October 9, 1936, now Patent No. 2,188,913, granted February 6, 1940. It comprises casing 20, detachable heads 59 formed with bosses for piston stops, all forming a cylindrical chamber within which inversely disposed pistons 60 with their packing cups 61 close off a liquid containing compartment 62 at each end. Between said pistons 60 and acting upon them is a resilient means including a plurality of compression springs 63 and a piston 64, the latter forming a seat for said compression springs, having a bearing upon the wall of said casing, for preventing weaving and buckling which would be inherent in a single spring of the required dimensions. Compartments 65 formed between said pistons are provided with openings 66 to the atmosphere for compensation of the changing positions of said pistons. This device provides dual supply means for dual hydraulic systems, maintaining the liquid therein under a normal equalized pressure, delivering it to the lines as required, and being self adapting to the quantity of liquid stored therein and variations in its volume due to changes in temperature. Each of said liquid containing compartments is connected to one of the compressors herein described by means of one of the conduits 19.

A bleeder vent with its plug 67 for the elimination of air from the system, is shown at the topmost part of compression chamber 10, and additional vents and plugs may be installed as required.

In the operation of the brakes, pedal 42 is advanced and with it the entire actuating assembly including plunger 48 and swingletree 53, the latter being free to revolve upon pivot 54 in accordance with the relative forward movement of piston rods 55 as required in their effecting the respective predetermined relative braking engagement. The consequent forward movement of pistons 11 causes liquid to be displaced from compression chambers 10, through conduits 27, into fluid motors 28, actuating said motors and their respective brake shoes, and imparting a predetermined proportion of the braking power through each of said dual hydraulic systems, any inequalities of displaced liquid required to operate the brakes corresponding to the respective compressors being compensated by a rotary movement of said swingletree.

In the event of negligence as to maintaining a proper adjustment of the brake shoes in their off-brakes relationship to their drums, as in taking up the slack due to wear of the frictional linings; and/or undue expansion of the drums occasioned by heat as due to excessive use of the brakes in descending long grades; it may happen that one or both of said compressor pistons 11 will reach the full extent of their respective ranges without the resulting displacement being sufficient to cause a satisfactory braking application. In this case, compressor piston 11 being fully advanced, compression spring 14 will be so compressed that a greater than usual restriction will be placed upon valve member 40, preventing the usual facility of the return movement of liquid from the wheel line; and this, together with the lack of sufficient hydraulic pressure, will set up the pumping action, liquid being drawn into the compression chamber through the pump inlet valve hereinbefore described; therefore, if the braking operation be immediately repeated, the compression chamber and wheel line will be found to have been replenished and the brake shoes can be moved through a greater range. When the liquid from the wheel line has finally returned to the compression chamber, any excess will find its way to the reservoir via the by-pass 21. Also, after the brakes are released, the by-pass 30 prevents the action of compression spring 14 upon valve member 40 from holding a greater pressure in the wheel line than in the compression chamber and reservoir, the entire system therefore being permitted to return to equilibrium.

In the event of failure of one of said dual hydraulic systems, the corresponding compressor piston 11, when a braking operation is made, will advance to the full extent of its range, where the engageable means 16, in cooperation with stop member 15, will check the advance, thereby maintaining the integrity of the remaining hydraulic system, and serve, through the operation of the swingletree 53 to divide the applied power, and retain through the remaining hydraulic system the same braking ratio as pertained to it prior to said failure.

What I claim as new is:

1. In a brake comprising dual master cylinders each including a cylinder and a pressure creating piston slidable therein, and both having a common operating means including a swingletree and dual piston thrust rods hinged to the respective ends thereof; the combination therewith of a piston-like member in each of said cylinders, engaging the respective piston in advance thereof and slidable therewith, and engageable means adapted to intercept the forward movement of said piston-like member, constituting means for conserving the integrity of one of said master cylinders in the event of a failure of hydraulic pressure in the other one.

2. The combination of claim 1 in which said engageable means is an annular shoulder formed in the wall of each of said dual cylinders.

3. In a brake comprising dual master cylinders, each including a cylindrical casing, a closure member for one end of the casing, and a piston slidable within the casing, all forming a chamber between the piston and the end closure member, said pistons having a common operating means including a swingletree and dual piston rods hinged to the respective ends there-

of; the combination therewith of a stop means for limiting the piston's range including an annular shoulder in the chamber wall.

4. In a brake comprising dual fluid pressure systems each having a compressor device including a cylinder and piston slidable therein, a common actuator for said pistons and linkage associating said actuator and said pistons including a swingletree adapted to distribute between said pistons the movement and power applied to said actuator; the combination of chambered recesses in said pistons for receiving thrust rods for their actuation and dual thrust rods hinged to the respective ends of said swingletree, each extending into one of said chambered recesses to a seat upon the respective piston in the central part of its diameter, in which combination the centers of the hinge pins are farther apart than the centers of said seats.

MALCOLM L. MASTELLER.