June 27, 1939. R. A. GOEPFRICH 2,163,874

COMPRESSOR FOR HYDRAULIC BRAKES

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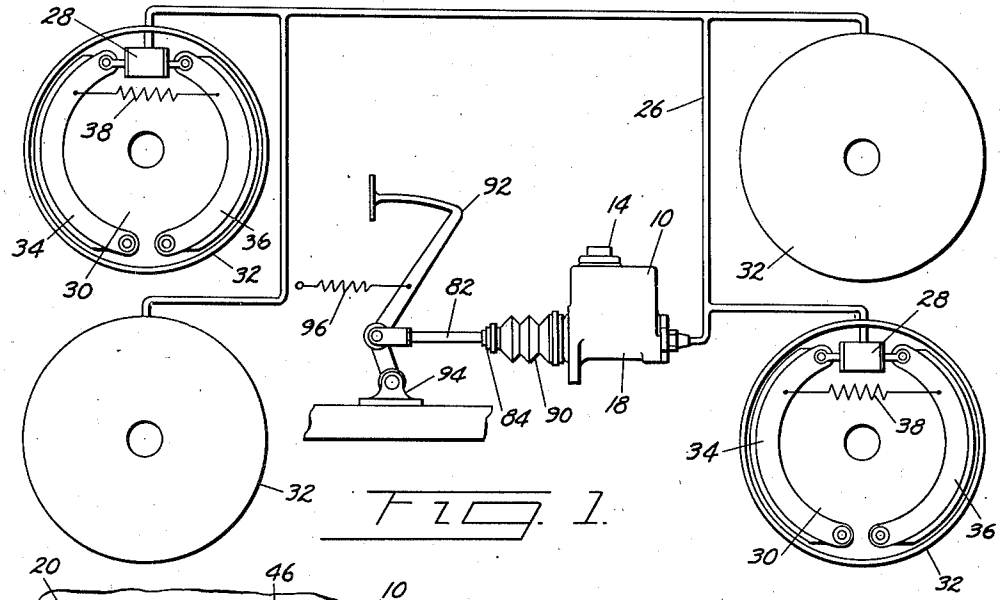


FIG. 1.

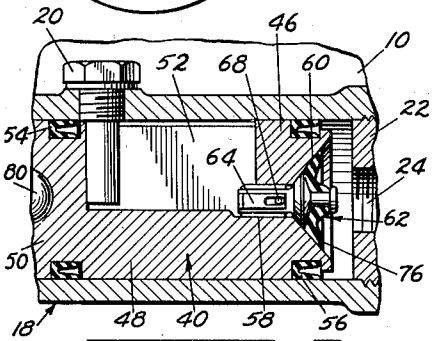


FIG. 3.

FIG. 2.

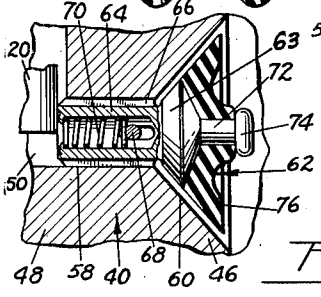


FIG. 4.

INVENTOR.
RUDOLPH A. GOEPFRICH
BY Jerome R. Cox.
ATTORNEY.

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COMPRESSOR FOR HYDRAULIC BRAKES

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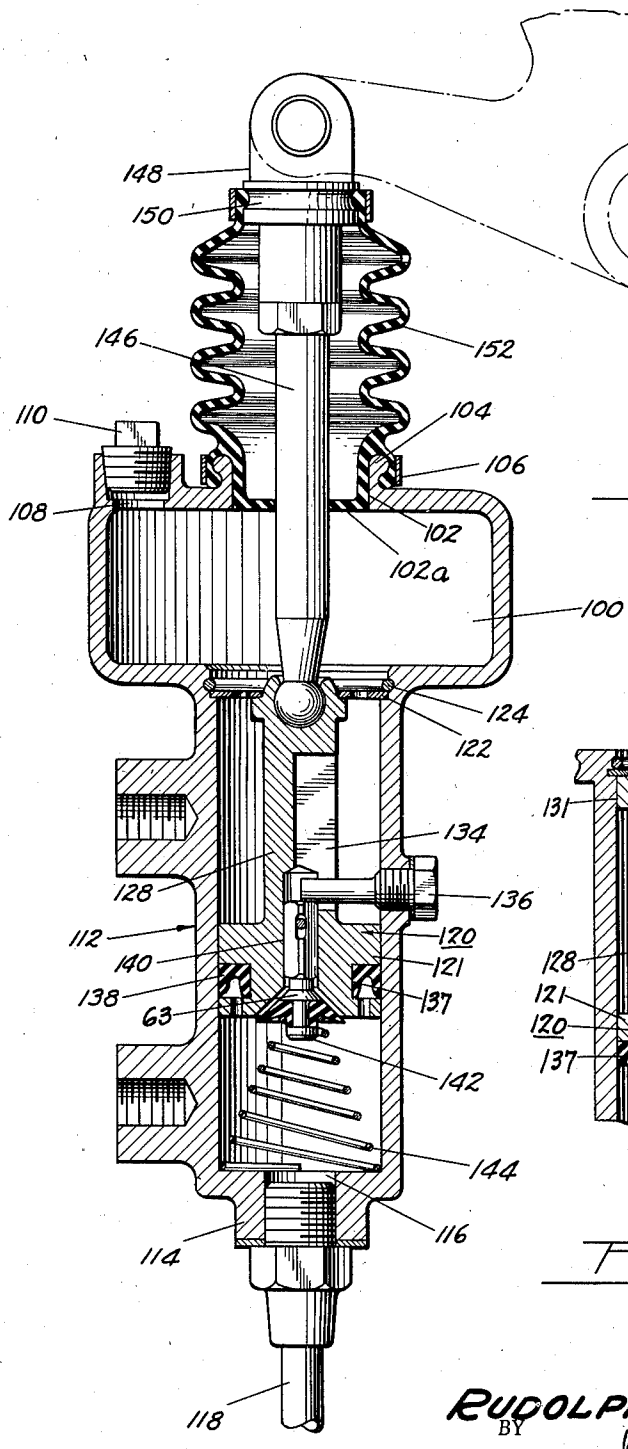


FIG. 5.

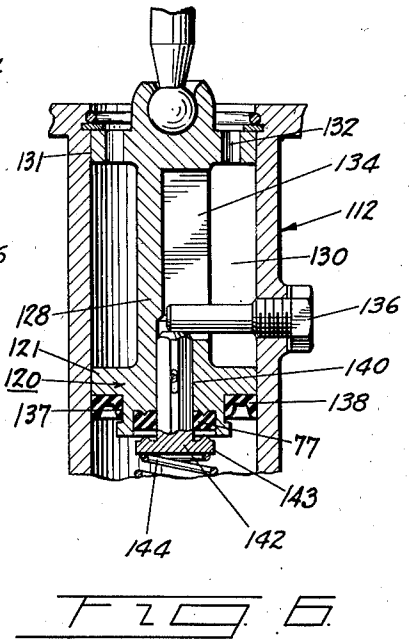


FIG. 6.

INVENTOR.
RUDOLPH A. GOEPFRICH
BY
Jerome R. Cox
ATTORNEY.

Patented June 27, 1939

2,163,874

UNITED STATES PATENT OFFICE

2,163,874

COMPRESSOR FOR HYDRAULIC BRAKES

Rudolph A. Goepfrich, South Bend, Ind., assignor to Bendix Products Corporation, South Bend, Ind., a corporation of Indiana

Application October 23, 1936, Serial No. 107,239

11 Claims. (Cl. 60—54.6)

This invention relates to fluid pressure braking systems, and more particularly to fluid pressure producing devices for such systems.

In conventional fluid pressure braking systems having a fluid pressure producing device including a fluid reservoir, a cylinder supplied therefrom, and a piston movable in the cylinder for producing pressure, the cylinder generally has two ports providing communications between the cylinder and the reservoir. These ports are known in the art as the supply port and the compensating port. The latter is located slightly in advance of a flexible cup seated on the head of the piston when the piston is in fully retracted position. When the piston moves on its compression stroke, the pressure created in the cylinder forward of the piston forces the wall of the cup into the compensating port and this results in serious injury to the cup, resulting in rendering the device inoperative. It is the aim of the present invention to overcome this undesirable condition.

An object of the invention is to provide a fluid pressure producing device including a fluid reservoir, a cylinder supplied therefrom, and a piston movable in the reservoir for producing pressure, and to eliminate from the structure such communications between the cylinder and the reservoir as may prove injurious to the piston.

Another object of the invention is to provide a fluid pressure producing device having a piston provided with means for by-passing fluid when the piston is in retracted position.

Another object of the invention is to provide a fluid pressure producing device including a reservoir, a cylinder supplied therefrom, a piston movable in the cylinder, and means for controlling the communication between the reservoir and that portion of the cylinder forward of the piston.

A feature of the invention is to provide a piston having a passage therethrough, and a valve of a particular structure for control of the passage.

Another feature of the invention is to provide a fluid pressure producing device including a reservoir, a cylinder associated therewith, a piston movable in the cylinder, a supply tube extending from the reservoir into the cylinder, and a valve in the head of the piston adapted to be tripped by the tube.

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

Fig. 1 is a diagrammatical illustration of a fluid brake system embodying the invention;

Fig. 2 is a vertical, sectional view of the fluid pressure producing device illustrating the piston thereof in retracted position;

Fig. 3 is a fragmentary view of the fluid pressure producing device illustrating the piston thereof on its compression stroke;

Fig. 4 is an enlarged detail view of the valve in the head of the piston of the fluid pressure producing device;

Fig. 5 is a vertical, sectional view of a modification of the fluid pressure producing device illustrating the piston thereof in its retracted position; and

Fig. 6 is a modification of the valve in the head of the piston of the fluid pressure producing device.

Referring to the drawings for more specific details of the invention, 10 represents a fluid reservoir having a filling opening 12 which may be closed as by a plug 14 having a plurality of openings 16 for venting the reservoir to the atmosphere. A cylinder 18 formed integral with the reservoir at the base thereof has an opening in its wall in which is mounted a hollow plug 20 providing a communication between the cylinder and the reservoir, and a head 22 fitted on the cylinder has an opening providing a discharge port 24 for the cylinder.

A fluid pressure delivery pipe 26 suitably connected to the discharge port 24 of the cylinder has branches connected respectively to fluid pressure actuated motors 28 arranged in pairs, one pair for the actuation of the brakes associated with the front wheels of a vehicle, and another for actuation of the brakes associated with the rear wheels of the vehicle.

The brakes may be of conventional type each including a fixed support or backing plate 30, a rotatable drum 32 associated with the backing plate, a pair of corresponding interchangeable friction elements or shoes 34 and 36 pivoted on the backing plate, and a motor corresponding to the motor 28 mounted on the backing plate between the shoes and operative to actuate the shoes into engagement with the braking surface of the drum 28 against the resistance of a retractile spring 38 connecting the shoes.

A piston 40 reciprocable in the cylinder 18 is retained against displacement by a washer 42 held against an annular shoulder in the open end of the cylinder by a retaining ring 44 seated in a circumferential groove in the wall of the cylinder. The piston has a head 46, a body portion 48, and a skirt 50. The body portion of the piston is slotted to provide, in conjunction with the wall of the cylinder, a chamber 52. This chamber receives the hollow plug 20 and communicates with the reservoir by way of the hollow plug. The skirt of the piston has a circumferential groove in which is seated a leak-proof washer 54 for inhibiting the seepage of fluid from the cylinder past the piston.

The head of the piston also has a circumferen-

tial groove adjacent its face in which is seated a leak-proof washer 56 for inhibiting the seepage of fluid past the piston, and the face of the piston is slightly reduced in cross-section so that upon a compression stroke of the piston the pressure on the fluid in the cylinder forward of the piston may readily act upon the washer to spread the lips thereof so as to provide a more efficient seal between the piston and the wall of the cylinder.

The head of the piston has a coaxial passage 58 opening into a concentric frustro-conical recess 60 in the face of the piston, the latter providing a valve seat of considerable magnitude, the purpose of which will hereinafter appear. The passage 58 and the recess 60 provide a communication between the chamber 52 and that portion of the cylinder 18 forward of the piston. This communication is controlled by a valve 62 having a stem 64 slidable in the passage 58. The stem is suitably channeled as at 66 to provide for the free flow of fluid through the passage 58 and is longitudinally slotted for the reception of a retaining pin 68. The stem may also be axially bored for the reception of a light spring 70 interposed between the free end of the stem and the retaining pin 68 for urging the valve to its seat. The head of the valve has an extension 72 terminating in a knob 74, and a leak-proof washer 76 sleeved on the extension and retained against displacement by the knob has a rim conforming to the wall of the frustro-conical recess so as to effectively seal the valve when it is in closed position.

It is to be especially noted that the valve 62 is formed with a conical metallic head 63 which is arranged to contact the frustro-conical recess 60 and form a primary seal. The washer 76 aids in sealing but the pressure of the liquid is taken by the metallic head 63 and thus the rubber element is relieved.

A recess 78 in the back of the piston receives a ball 80 formed on one end of a rod 82 having thereon an adjustable collar 84. The ball is suitably secured in the socket as indicated at 86 so that the rod and piston may move in unison. A coil spring 88 is sleeved on the rod between the collar 84 and the washer 42 in the open end of the cylinder. This spring serves to return the rod and hence the piston connected to the rod to their retracted positions, and a flexible boot 90 sleeved on the rod and connected between the collar 84 and the open end of the cylinder excludes dust and other foreign substances from the cylinder. As shown, the rod 82 is connected to a foot pedal lever 92 pivoted on a fixed support 94, and the foot pedal lever may be connected by a retractile spring 96 to a fixed support.

Modifications of the invention are illustrated in Figs. 5 and 6. In the modification of Fig. 5 a reservoir 100 has an opening 102 in its top, and formed on the perimeter defining the opening is a flange 104 having a circumferential groove 106, the purpose of which will hereinafter appear. The reservoir is provided with a filling opening 108 which may be closed as by a plug 110 and depending from the reservoir in axial alignment with the opening 102 and in direct communication with the reservoir is a cylinder 112 having a head 114 provided with a discharge port 116 which may be suitably connected to a fluid pressure delivery pipe 118 corresponding to the fluid pressure delivery pipe illustrated in the preferred form of the invention.

A piston 120 reciprocable in the cylinder seats when in its retracted position on a washer 122 held against an annular shoulder in the open end of the cylinder by a retaining ring 124 seated in a groove in the wall of the cylinder. The piston has a reduced body portion 128 (providing in conjunction with the wall of the cylinder an annular chamber 130 communicating with the reservoir by way of a plurality of spaced ports 132), which is slotted as indicated at 134 for the reception of a pin or stop 136 mounted in the wall of the cylinder. The head of the piston 121 is formed with a groove 137 in which it carries a leak-proof washer 138. It is provided with an axial passage 140 controlled by a valve 142 urged to its seat by a spring 144 interposed between the valve and the head of the cylinder and retained in open position when the piston is in its retracted position by the stop 136.

A rod 146 has one of its ends suitably connected to the piston 120 and its other end adjustably connected to a clevis 148 having thereon a collar 150 connected as by a flexible boot 152 to the flange 104 on the reservoir for the exclusion of dust and other foreign substances from the reservoir, and pivotally connected to the clevis 148 is a conventional foot pedal lever 154 which may be connected by a retractile spring, not shown, to a fixed support, also not shown. The rod 146 extends through the opening 102 and the passage of the rod through the opening is sealed by a portion 102a of the boot 152.

In the form shown in Fig. 6 the head 121 is shortened, the groove omitted and the cup 138 positioned adjacent to the lower end. An additional bearing surface 131 is provided adjacent to the upper end of the piston and ports 132 provide means by which the reservoir 100 may communicate with the chamber 130. The valve 142 is provided with a metallic head 143 which is arranged to seat on a washer 77 secured to the piston head 121.

In a normal operation of either the preferred or the modified form of the invention, assuming that the system is filled with a suitable fluid, upon depressing the foot pedal lever force is transmitted from the lever through the rod to the piston to move the piston on its compression stroke. As the piston moves on its compression stroke, the valve in the head of the piston is released, and is urged by the spring 70 or 144, as the case may be, to its seat. Thereafter the pressure on the fluid in the cylinder forward of the piston is received on the head of the piston and the fluid is displaced from the cylinder through the fluid pressure delivery pipe 24 and its respective branches to the fluid pressure actuated motors 28 resulting in actuation of the motors with the consequent spreading of the shoes 34 and 36 into drum engagement to effectively retard rotation of the drum.

Upon the completion of a braking operation, the operator releases the foot pedal lever, whereupon the retractile spring connected to the lever becomes effective to return the lever to its retracted position. As the lever returns to its retracted position, the piston also moves to its retracted position under the influence of the spring 88, or the spring 144, as the case may be. As the piston moves to its retracted position, a partial vacuum is created in the cylinder forward of the piston, resulting in cracking the valve 60 or 142, as the case may be, and drawing fluid from the reservoir into the cylinder to completely fill the cylinder, and when the piston is returned to its fully retracted position the hollow plug 20 or the stop 136 engages the valve

60 or 142 and retains the valve open so as to establish communication between the reservoir and that portion of the cylinder forward of the piston.

During the retraction stroke of the piston fluid is returning from the fluid pressure actuated motors 28 and the pipe system connecting these motors to the cylinder under the influence of the retractile springs 38 connected between the friction elements. The fluid returned from the fluid pressure actuated motors 28 and the piping system connecting these motors to the cylinder 18 may be in excess of the quantity of fluid required to fill the cylinder, and this excess fluid is returned by way of the valve in the head of the piston, the chamber back of the head of the piston, and the hollow plug to the reservoir.

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

Having thus described the various features of the invention, what I claim as new and desire to secure by Letters Patent is:

1. A fluid pressure producing device comprising a reservoir, a cylinder supplied therefrom, a piston moving in the cylinder having a passage therethrough, a valve controlling the passage, and means comprising a hollow tube forming a liquid passageway from said reservoir to said cylinder and extending into the cylinder for holding the valve open when the piston is in fully retracted position.

2. A fluid pressure producing device comprising a reservoir, a cylinder supplied therefrom, a piston movable in the cylinder having a passage therethrough, a valve for controlling the passage, means for urging the valve to its seat, and means comprising a hollow tube forming a liquid passageway from said reservoir to said cylinder for holding the valve open when the piston is in fully retracted position.

3. A fluid pressure producing device comprising a reservoir, a cylinder supplied therefrom, a piston reciprocable in the cylinder having a passage therethrough, a spring-pressed valve controlling the passage, sealing means carried by the valve, and means comprising a hollow tube forming a liquid passageway from said reservoir to said cylinder for holding the valve open when the piston is in fully retracted position.

4. A fluid pressure producing device comprising a reservoir, a cylinder associated therewith, a piston movable in the cylinder having a passage therethrough, a valve controlling the passage, and a supply tube extending from the reservoir into the cylinder arranged to trip the valve when the piston is returned to its retracted position.

5. A fluid pressure producing device comprising a reservoir, a cylinder associated therewith, a piston reciprocable in the cylinder having a passage therethrough, a valve for controlling the passage, a sealing member carried by the valve, means urging the valve to its seat, and a supply tube extending from the reservoir into the cylinder arranged to retain the valve in open position when the piston is in fully retracted position.

6. A fluid pressure producing device comprising a reservoir, a cylinder associated therewith, a piston reciprocable in the cylinder having an axial passage and a frustro-conical recess in its face communicating with the passage, a valve for controlling the passage having a stem slidable therein and a head adapted to seat in the recess, a flexible member on the head of the valve cooperating with the wall of the recess to seal the valve, means for urging the valve to its seat, and a supply tube extending from the reservoir into the cylinder and arranged to retain the valve open when the piston is in fully retracted position.

7. A fluid pressure braking system comprising a reservoir, a cylinder associated therewith, a piston reciprocable in the cylinder having a passage therethrough, a valve controlling the passage, means for urging the valve to its seat, a supply tube extending from the reservoir into the cylinder and arranged to retain the valve open when the piston is in fully retracted position, fluid pressure actuated motors operatively connected to the cylinders, elements actuated by the motors, and means for actuating the piston.

8. A fluid pressure braking system comprising a reservoir, a cylinder associated therewith, a piston reciprocable in the cylinder having an axial passage and a frustro-conical recess in its face providing a passage through the piston, a valve controlling the passage having a part slidable in the axial port and another part adapted to seat in the recess, a flexible sealing member carried by the valve, means urging the valve to its seat, a supply tube extending from the reservoir into the cylinder and arranged to retain the valve open when the piston is in fully retracted position, fluid pressure actuated motors operatively connected to the cylinder, elements actuated by the motors, and means for actuating the piston.

9. A fluid pressure producing device comprising a reservoir; a cylinder associated therewith; a piston movable in the cylinder having an axial passage therethrough and being formed with a recess communicating with the passage; a valve controlling the passage comprising a guide portion slidable in said passage, a head portion seating in the recess, and a sealing member on the head; and a supply tube extending from the reservoir into the cylinder arranged to trip the valve when the piston is returned to its retracted position.

10. A fluid pressure producing device comprising a reservoir; a cylinder associated therewith; a piston movable in the cylinder having an axial passage therethrough and being formed with a frusto conical recess communicating with the passage; a valve controlling the passage comprising a stem slidable in said passage, a sealing head seating in the recess, and a sealing member carried by the head; and a supply tube extending from the reservoir into the cylinder arranged to trip the valve when the piston is returned to its retracted position.

11. A fluid pressure producing device comprising a reservoir; a cylinder associated therewith; a piston having a frusto conical valve seat movable in the cylinder, and having a passage therethrough; a valve comprising a metallic frusto conical portion and a rubber washer secured thereto controlling the passage, and a supply tube extending from the reservoir into the cylinder arranged to trip the valve when the piston is returned to its retracted position.

RUDOLPH A. GOEPFRICH.