Nov. 11, 1930. R. F. PEO 1,781,127

SHOCK ABSORBER

Filed March 10, 1930

Fig. 1.

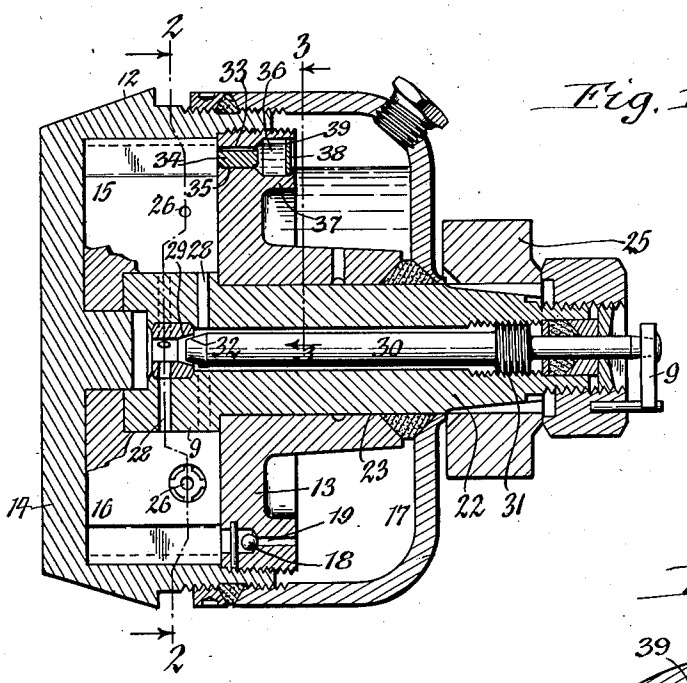


Fig. 3.

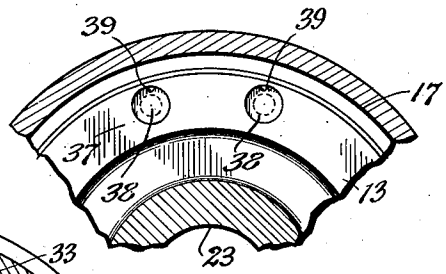
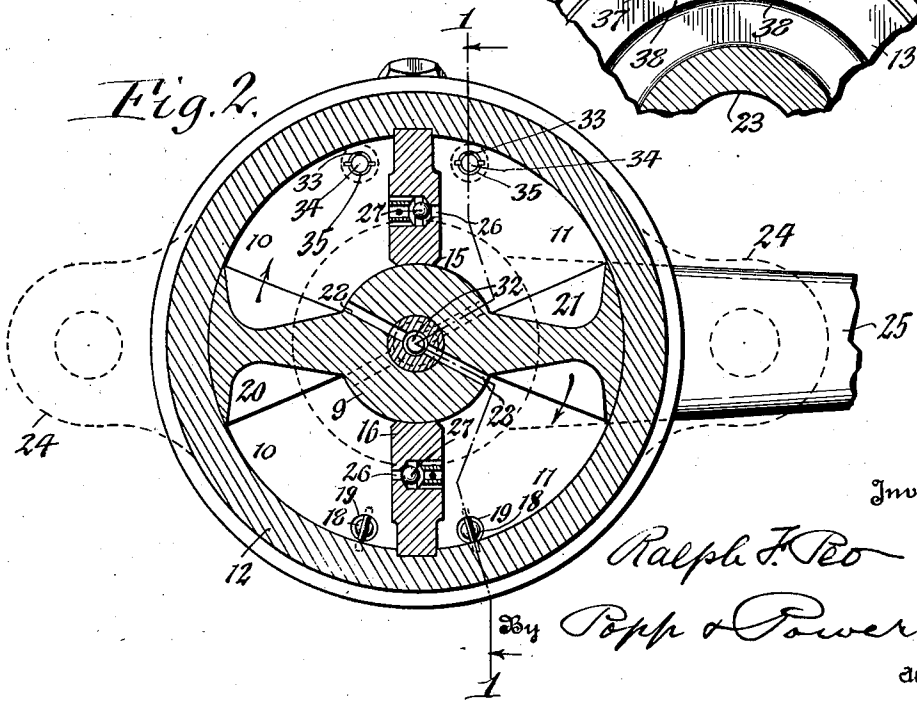


Fig. 2.



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UNITED STATES PATENT OFFICE

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SHOCK ABSORBER

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This invention relates to a shock absorber which utilizes a liquid as the resistance medium and more particularly to a hydraulic shock absorber of the Houdaille type.

In such shock absorbers the vent openings leading from the upper parts of the working chamber to the upper part of the liquid replenishing chamber were necessarily made comparatively small so as to enable the air and liquid to escape from the working chambers to the replenishing chamber but prevent return flow of air from the replenishing chamber to the working chambers through such vent passage. These vent passages however were made so small that they were liable to become clogged with dirt or impurities in the resistance liquid and also any small particles of metal which may have remained within the working chamber in the course of manufacture or produced by wearing of the parts. When clogging of the vent passages occurs the air is retained in the working chambers together with the resistance liquid therein and thereby reduces the shock resisting efficiency of the same.

It is the object of this invention to provide venting means for discharging air and liquid from the working chambers into the replenishing chamber without permitting any air to return from the replenishing chamber to the working chambers and to accomplish this purpose without liability of clogging the vent passage.

In the accompanying drawings:

Figure 1 is a vertical longitudinal section of a shock absorber embodying a satisfactory form of my invention, and taken on line 1—1 Fig. 2.

Figure 2 is a vertical transverse section taken on line 2—2 Fig. 1.

Figure 3 is a fragmentary vertical transverse section taken on line 3—3 Fig. 1.

In the following description similar characters of reference indicate like parts in the several figures of the drawings.

My invention may be embodied in various forms and in hydraulic shock absorbers of different constructions, and the present application is therefore to be regarded merely as one organization which satisfactorily carries out the invention in practice. As here shown the same is constructed as follows:—

The numerals 10, 11 represent two semi-cylindrical working chambers which are formed within a circular or cylindrical wall 12, front and rear transverse walls 13, 14 connected with the front and rear ends of the circular wall, and upright partition sections 15, 16 which separate the working chambers. The latter are filled with a resistance liquid such as oil and this is supplied automatically from a liquid replenishing chamber 17 arranged in front of the working chambers and connected at its lower end with the lower ends of one or both working chambers by means of check valves 18 which are arranged in replenishing ports 19 in the lower part of the front wall 13, which latter forms a partition between the replenishing chamber and the working chamber. These check valves permit resistance liquid to pass from the replenishing chamber into the working chambers but not in the reversed direction.

Oscillating within the working chambers are two pistons 20, 21 which are connected with opposite sides of a hub 9 turning between the partition sections 15, 16 which hub is formed on the rear end of a rock shaft 22 journaled in a bearing 23 on the partition wall 13. The circular wall 12 and rear wall or head 14 thereof constitute the body of the absorber and these are provided with lugs 24 for attaching the same to the frame of an automobile, and the front end of the rock shaft is provided with a rock arm 25 which is connected with an axle of the automobile so that when the frame and axle move toward and from each other the pistons in the working chambers will be oscillated. Obviously the body or cylinder containing the working chambers and pistons may be attached, respectively to other relatively movable parts.

In the present case it is assumed that the pistons move in the direction of the arrow associated therewith in Fig. 2, so that the left piston 20 moves upwardly and the right piston downwardly while effecting their high pressure strokes, and in a reverse direction while effecting their low pressure strokes.

During the low pressure strokes of the pis-

tons the resistance liquid is free to flow through bypass ports 26 in the partition sections 15, 16 from the low pressure end of each working chamber to the high pressure end of the other working chamber but flow of this liquid through these ports in the opposite direction is prevented during the high pressure strokes of the pistons by check valves 27 arranged in these ports.

Regulation of the liquid resistance is effected by regulating passages 28 formed in the hub of the pistons and connecting opposite ends of the working chamber with each other and provided with a valve seat 29 and a valve stem 30 arranged axially within the rock shaft and connected therewith by a screw joint 31 for the purpose of adjusting the same by means of a handle 9 at the outer end thereof and thereby moving a valve 32 at the inner end thereof toward and from the valve seat 29 and regulating the flow of liquid through the passages 28 accordingly.

Extending from the upper part of one or both working chambers to the upper part of the replenishing chamber is a vent passage 33 which is preferably formed lengthwise in the periphery of a cylindrical plug 34 secured in an opening 35 in the upper part of the partition wall 13.

The rear or inner end of the vent passage opens directly into one of the working chambers but the front or outer end of the same communicates indirectly with the replenishing chamber through the medium of a sealing pocket or sediment collecting chamber 36 which is adapted to contain a quantity of sealing liquid. This sealing or collecting chamber is formed in an annular bead or rim 37 arranged on the front side of the partition or front head 13 and preferably formed integrally therewith, as shown in Fig. 1. The bottom of the sealing or collecting chamber 36 is arranged below the level of the vent passage 33, and the opening 35 of this partition and a closure disk or head 38 is secured in the front or outer end of the collecting or sealing chamber 36 and provided on the upper part of its edge with a notch or vent opening 39 which is arranged higher than the vent passage 33 in the plug 34.

During the normal operation of the shock absorber each piston while moving upwardly in its respective working chamber forces some of the liquid from this chamber through the vent passage 33 into the sealing pocket, keeping the latter full up to the vent opening 39 and covering the outer or front end of the vent passage 33. Any excess liquid above the capacity of the sealing pocket escapes through this vent opening 39 into the replenishing chamber. Any air which is present in the liquid in the working chambers is forced by the rising piston outwardly from the respective working chamber through the vent passage 33, the liquid in the sealing pocket and the vent opening 39 into the replenishing chamber. As the vent opening 39 is arranged at a greater elevation than the vent passage 33 the air in travelling from this vent passage to said vent opening must pass through the body of liquid in the sealing pocket so that this liquid forms a liquid seal or trap whereby air is prevented from returning from the replenishing chamber to the respective working chamber through said vent passage. During the downward stroke of either piston any reverse or backward flow of fluid in the respective vent passage 33 will consist of liquid only without sucking any air from the replenishing chamber back into the respective working chamber.

This construction therefore permits of using a vent of larger capacity or cross section which has the advantage of being self-cleaning due to the fact that any dirt and worn particles from the working parts will readily go out through the vent passage without clogging the same and be collected in the bottom of the sealing chamber which is arranged below the vent passage and therefore also serves as a sediment collecting chamber. When gathered at this point the sediment can do no harm and this feature therefore constitutes an important part of this invention.

Due to the fluid resistance exerted by the body of liquid in the sealing and sediment collecting chamber in opposition to the column or stream of liquid forced outwardly through the vent passage 33 it is possible to make this vent passage larger without reducing the effective instrument strength as would otherwise be the case. By providing the outer side of the partition or front head 13 with an annular integral rim or bead 37 it is possible to form the sealing or sediment pocket 36 in any part thereof and permits of screwing the front partition tightly against the peripheral wall 12 of the body and still always bring each of the sealing pockets in the correct position relative to the upper end of the respective working chamber. This result is preferably accomplished by first screwing the partition 13 tightly into the body wall 12 and then spotting the places where the borings for the openings 35 and the pockets 36 should come, after which this partition is removed, the borings 35 and 36 made therein, the plugs 34 and disks 38 secured in the borings 35 and 36, and then this partition is again screwed tightly into the absorber body which brings the vents into their proper position.

This improvement is very effective and adds materially to the shock absorbing capacity of the absorber and also prevents the same from becoming clogged or air bound without appreciably increasing the cost of the instrument.

I claim as my invention:

1. A shock absorber comprising a working

chamber adapted to contain a resistance liquid; a piston movable back and forth in said working chamber; a replenishing chamber from which liquid is supplied to said working chamber, a partition wall between said chambers containing a vent passage leading from the upper part of said working chamber to the upper part of said replenishing chamber, and a pocket which is arranged at that end of said vent passage which opens into the replenishing chamber and which is adapted to contain a quantity of liquid covering said vent passage and forming a liquid seal for the same, said pocket receiving its sealing liquid solely from said working chamber through said vent passage.

2. A shock absorber comprising a working chamber adapted to contain a resistance liquid; a piston movable back and forth in said working chamber; a replenishing chamber from which liquid is supplied to said working chamber, a partition wall between said chambers containing a vent passage leading from the upper part of said working chamber to the upper part of said replenishing chamber, and a pocket which is arranged at that end of said vent passage which opens into the replenishing chamber and which is adapted to contain a quantity of liquid covering said vent passage and forming a liquid seal for the same, said pocket having a wall formed integrally with said partition wall.

3. A shock absorber comprising a working chamber adapted to contain a resistance liquid; a piston movable back and forth in said working chamber; a replenishing chamber from which liquid is supplied to said working chamber, a partition wall between said chambers containing a vent passage leading from the upper part of said working chamber to the upper part of said replenishing chamber, and a pocket which is arranged at that end of said vent passage which opens into the replenishing chamber and which is adapted to contain a quantity of liquid covering said vent passage and forming a liquid seal for the same, said liquid being received by said pocket solely from the working chamber through said vent passage, and the wall of said pocket being formed integrally with said partition.

4. A shock absorber comprising a working chamber adapted to contain a resistance liquid; a piston movable back and forth in said working chamber; a replenishing chamber from which liquid is supplied to said working chamber, a partition wall between said chambers containing a vent passage leading from the upper part of said working chamber to the upper part of said replenishing chamber, and a pocket which is arranged at that end of said vent passage which opens into the replenishing chamber and which is adapted to contain a quantity of liquid covering said passage and forming a liquid seal for the same, said pocket communicating at one end with said vent passage, and a closure disk extending across the opposite end of said pocket and provided with a vent opening higher than said vent passage.

5. A shock absorber comprising a working chamber adapted to contain a resistance liquid; a piston movable back and forth in said working chamber; a replenishing chamber from which resistance liquid is supplied to said working chamber; a partition wall arranged between said working and replenishing chambers; a vent plug arranged in the upper part of said partition wall and provided with a vent passage opening at its inner end into the upper end of said working chamber; a liquid sealing pocket communicating at its inner end with the outer end of said vent passage and having a wall the inner end of which connects with said partition wall; and a closure disk secured in the outer end of said pocket and provided in its upper edge with a vent notch arranged above said vent passage, said sealing pocket being adapted to receive a quantity of liquid which submerges the outer end of said vent passage and forms a liquid seal therefor which prevents the passage of air from the replenishing chamber to the working chamber but permits the passage of air and liquid from the working chamber to the sealing pocket and replenishing chamber.

6. A shock absorber comprising a working chamber adapted to contain a resistance liquid; a piston movable back and forth in said working chamber; a replenishing chamber from which liquid is supplied to said working chamber; a partition wall between said chambers containing a vent passage leading from the upper part of said working chamber to the upper part of said replenishing chamber; and a pocket which is arranged at that end of said vent passage which opens into the replenishing chamber and which is adapted to contain a quantity of liquid covering said vent passage and forming a liquid seal for the same, the bottom of said pocket being arranged below said vent passage and forming a sediment collecting space.

7. A shock absorber comprising a working chamber adapted to contain a resistance liquid; a piston movable back and forth in said working chamber; a replenishing chamber from which liquid is supplied to said working chamber, a partition wall between said chambers containing a vent passage leading from the upper part of said working chamber to the upper part of said replenishing chamber; and a pocket which is arranged at that end of said vent passage which opens into the replenishing chamber and which is adapted to contain a quantity of liquid covering said vent passage and forming a liquid seal for the same, the bottom of said pocket

being arranged below said vent passage and forming a sediment collecting space, and said pocket being provided with a vent opening which is arranged higher than said vent passage and which leads to the upper part of said replenishing chamber.

In testimony whereof I hereby affix my signature.

RALPH F. PEO.