F. V. PHILLIPS.

FLUID SHOCK ABSORBER.

APPLICATION FILED JUNE 23, 1916.

1,255,787.

Patented Feb. 5, 1918.

2 SHEETS—SHEET 1.

Fig. 1.

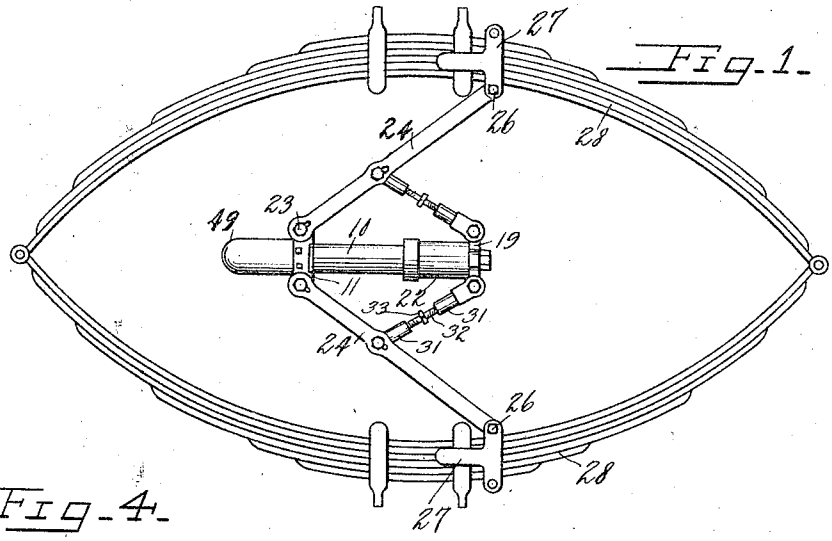


Fig. 4.

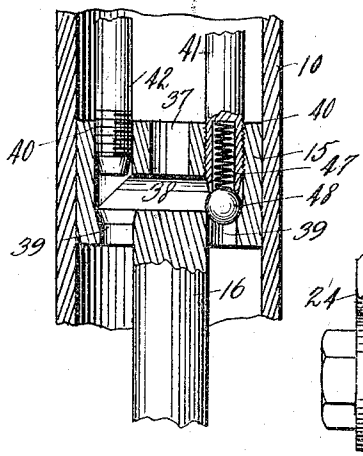


Fig. 5.

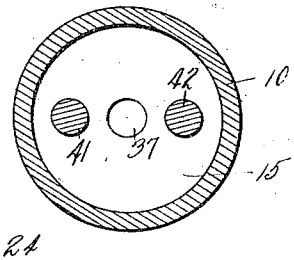
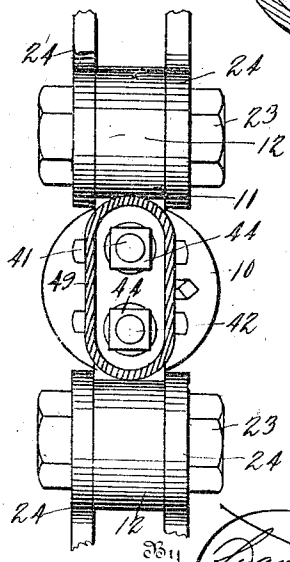


Fig. 6.



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2 SHEETS—SHEET 2.

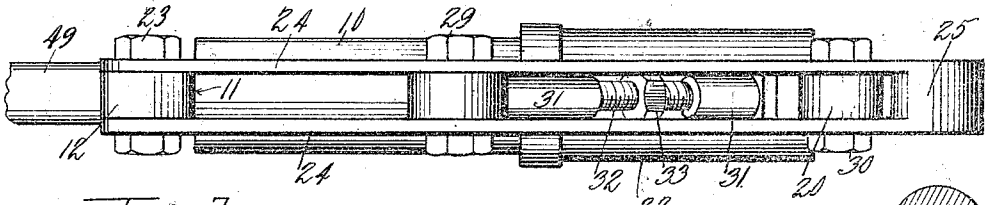


Fig 2

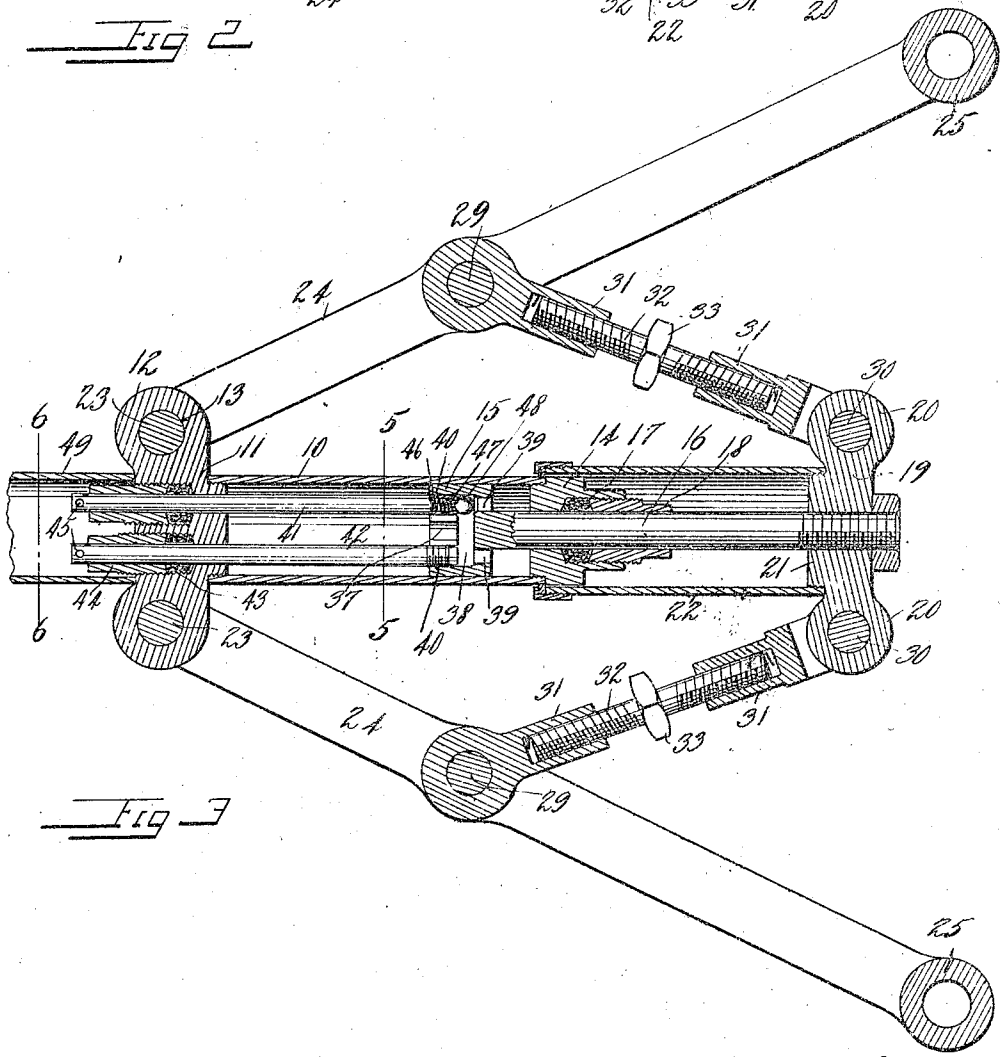


Fig 3

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UNITED STATES PATENT OFFICE.

FRANCIS V. PHILLIPS, OF ORLANDO, FLORIDA.

FLUID SHOCK-ABSORBER.

1,255,787. Specification of Letters Patent. Patented Feb. 5, 1918.

Application filed June 28, 1916. Serial No. 105,423.

To all whom it may concern:

Be it known that I, FRANCIS V. PHILLIPS, a citizen of the United States, residing at Orlando, in the county of Orange, State of Florida, have invented certain new and useful Improvements in Fluid Shock-Absorbers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to shock absorbers such as are used in connection with automobiles and other types of vehicles for the purpose of absorbing the shocks incident to the compressive and reaction movements of the springs. More especially the invention relates to a shock absorber of the fluid type wherein there is employed a piston and cylinder, the piston having a small passage therethrough and the cylinder being more or less completely filled with fluid so that movement of the piston is resisted by reason of the resistance to the passage of the fluid through the small opening or passage.

Heretofore in devices of this character it has been found difficult to provide for the necessary length of movement of the piston in the cylinder, it being usual to place such cylinders in a vertical position and the construction and height of the car interfering with such positioning of the cylinders in places where they will be free from injury by contact with objects on the road.

One of the important objects of the invention is to provide an improved general construction of device of this character wherein the device may be used in such position that it will be free from the probability of accidental injury from objects along the road and wherein the piston movement while sufficient to allow for the entire movement of the springs, will be shortened by means of the arrangement used so that a short cylinder may be utilized.

It is also found that devices of this character lack in the important feature of regulating the movement of the piston so that it will have greater resistance in moving in one direction than in the other.

A second important object of the present invention is to provide a device of this character so constructed and arranged that the resistance to the movement of the piston in either direction may be regulated, the resistance to movement in one direction being regulated independently of the resistance to movement in the other direction.

Furthermore it has been found that where an attempt has been made to provide a plurality of valves in the piston for regulating the movement the cylinder could not be filled completely with the usual liquids employed since the quantity of liquid displaced by the stems of said valves in moving in one direction was not compensated by the space left by the movement of the piston rod in the same direction and vice versa.

A third important object of the invention is to provide an improved structure of this character wherein the valve stems and piston rod will be so arranged as to perfectly compensate for each other.

With the above and other objects in view, as will be hereinafter apparent the invention consists in general of certain novel details of construction and combination of parts hereinafter fully described, illustrated in the accompanying drawings, and specifically claimed.

In the accompanying drawings, like characters of reference indicate like parts in the several views, and:—

Figure 1 is a side elevation of a set of double elliptic springs showing the device applied thereto in its normal position.

Fig. 2 is an enlarged top plan view of the device, the valve stem dust cap being broken away.

Fig. 3 is a vertical central longitudinal section through the structure shown in Fig. 2, with parts in elevation.

Fig. 4 is a detail section of part of the device shown in Fig. 3, one of the valve stems being shown as holding the check valve used in closed position.

Fig. 5 is a detail view on the line 5—5 of Fig. 3.

Fig. 6 is a detail view on the line 6—6 of Fig. 3.

In the embodiment of the invention herein illustrated there has been shown a cylinder 10 having at one end a head 11 which is screwed into the cylinder and from which projects a pair of ears 12 provided with bolt receiving openings 13. On the end of the cylinder 10 there is provided a head 14 screwed into the cylinder and having a projecting portion of the same external diameter as the cylinder. Slidably mounted within this cylinder is a piston 15 which is

preferably formed on the end of the piston rod 16. This piston rod 16 passes through the head 14, the latter being provided with a stuffing box 17 and gland 18 for the purpose of preventing leakage around the rod 16. Mounted on the end of the rod 16 is a yoke 19 provided with a pair of eyes 20 and having a circular portion 21 facing the cylinder. This circular portion is threaded exteriorly for the reception of a sleeve 22 which slides over the cylinder 10 and head 14 so as to form a dust cap for this end of the cylinder. Passing through each of the ears 12 are bolts 23 and on the ends of these bolts are mounted pairs of arms 24 which are held in spaced relation at their opposite ends by means of a thimble 25 arranged to receive a bolt 26, this bolt being one of the attaching bolts of a clip 27 adapted to secure the respective pair of arms 24 to the upper or lower half of the elliptic spring 28. Bolts 29 are provided intermediate the ends of each pair of the arms 24 and similar bolts 30 pass through the yoke eyes 20. Secured to each of the bolts 29 and 30 is a member 31 which is threaded interiorly, the threads on the members secured to the yoke being of opposite hand to the members secured to the bolts 29. At 32 are rods which have right and left hand screws on their ends so as to engage in the threaded recesses of the members 31 and each of these rods is provided with a polygonal central portion constituting a nut 33 so that by turning the nut 33 the bolts 30 and 29 may be caused to move to or from each other.

When the free ends of the arms 24 are moved toward each other in a perpendicular line, such as is the case when the springs 36 are compressed, then the cylinder 10 will move in one direction and the piston 15 in the opposite direction. When these ends move apart in the same straight line the cylinder and piston will each move in the opposite direction. Now, by reason of the angles at which the arms 24 are set a relatively great movement of the ends connected to the clips 27 is necessary in order to effect a relatively small movement of the piston 15 and cylinder 10 so that the full compressive or expansive tendency of the springs may be met by a comparatively short movement of the piston in the cylinder.

Opening through the center of the piston is a passage 37 having its inner end communicating with a cross passage 38 from whence leads a pair of passages 39 opening on the opposite face of the piston 15 to the opening 37. Alined with these passages 39 are threaded openings 40 wherein are screwed the threaded ends of a pair of valve rods or stems indicated respectively at 41 and 42. These rods or stems 41 and 42 pass through stuffing boxes 43 formed in the head 11 and these boxes are provided with the usual glands 44 so that the leakage of liquid from the cylinder around the rods 41 and 42 is prevented. The outer ends of these rods are provided with suitable arrangements for engagement by a turning tool, the arrangement here being illustrated as transverse openings 45.

The inner ends of the passages 39 are formed as valve seats and the end of the valve rod 42 is similarly formed as a valve. The end of the rod 41 is hollow as shown at 46 and in this hollow portion is located a spiral spring 47 which protrudes from the end of the rod and engages a ball check valve 48 and urges said valve constantly toward its seat in the inner end of its passage 39.

It is obvious that by adjustment of the rods 41 the spring holding end of said rod may be brought into contact with the ball 48 and thus force it firmly against its seat and hold it from all movement away from said seat. It is likewise obvious that by proper movement of the rod 42 the valve end may be caused to approach or recede from the seat so that the passage formed by the separate openings 37, 38, and 39 on the side controlled by this valve rod or stem 42 may be varied in cross sectional area at will.

It is to be noted that care is exercised so that the cross sectional area of the piston rod 16 will be equal to the combined cross sectional areas of the stems or rods 41 and 42. Thus the movement of the piston 15 in either direction will displace from one side a quantity of the fluid contents of the cylinder while precisely the same amount of space which was formerly occupied by this displaced fluid will be afforded on the opposite side of said cylinder.

In order to protect the valve stems or rods 42 from collecting dust the head 11 carries a dust cap 49 of substantially oval cross section as clearly shown in Fig. 6.

In the operation of the device if it is desired to have an even resistance to the movement of the piston in either direction a ball check 48 is forced down on its seat by the rod 41 being turned in the proper direction. Then the rod 42 is adjusted to give the required resistance to the fluid flowing through the passages 37, 38, and 39, the latter being that passage opposite the one closed by the ball valve 48. Under these conditions the flow of the fluid in either direction will be resisted equally. If it is desired to employ a greater resistance to the reactive movement of the springs than to the compressive movement then the rod 41 is moved so as to allow the ball valve to move off of its seat when force is exerted to compress the spring 47. Under these circumstances fluid will flow through both of the passages 39 when the springs are compressed, but, when the

springs expand, one of the passages 39 will be closed by the ball valve so that the fluid will only flow through the other one, thus offering a greater resistance to movement in this direction. It will be obvious that by altering the connections of the arms 24 and the links formed by the members 31 and 32 so that the arms are connected to the yoke 21 and the links to the head 11 there will be a greater resistance to compression than to expansion under the conditions that the ball valve is opened.

There has thus been provided a simple and efficient device of the kind described and for the purpose specified.

It is obvious that many minor changes may be made in the form and construction of the invention without departing from the material principles thereof. It is not therefore desired to confine the invention to the exact form herein shown and described but it is wished to include all such as properly come within the scope claimed.

Having thus described the invention, what is claimed as new, is:—

1. A shock absorber including a relatively movable piston and cylinder, the piston being provided with a substantially U-shaped fluid passage therethrough, a check valve associated with the said piston and arranged in one branch of the U-shaped passage for controlling the flow of fluid therethrough in one direction, means movable longitudinally of the other branch of the U-shaped passage and adapted to restrict the flow of fluid therethrough upon movement of the piston in either direction, and means to effect relative movement of the piston and cylinder.

2. A shock absorber including a relatively movable cylinder provided with heads and a piston having a plurality of fluid passages therein, a check valve closing one of said passages against movement of fluid in one direction therethrough, means extending slidably through a head and carried by the piston to effect variable restriction of the other passage, and means to effect relative movement of the piston and cylinder.

3. A shock absorber including a relatively movable cylinder provided with heads and a piston having a plurality of fluid passages therein, a check valve closing one of said passages against movement of fluid in one direction therethrough, means extending slidably through a head and carried by the piston to adjust the extent of opening of the check valve, and means to effect relative movement of the piston and cylinder.

4. A shock absorber including a relatively movable cylinder provided with heads and a piston having a plurality of fluid passages therein, a check valve closing one of said passages against movement of fluid in one direction therethrough, means extending slidably through a head and carried by the piston to adjust the extent of opening of the check valve, other means extending slidably through a head and carried by the piston to variably restrict the other passage, and means to effect relative movement of the piston and cylinder.

5. A shock absorber including a relatively movable cylinder provided with heads and a piston having a plurality of fluid passages therein, a check valve closing one of said passages against movement of fluid in one direction therethrough, means extending slidably through a head and carried by the piston to adjust the extent of opening of the check valve, other and independent means extending slidably through a head and carried by the piston to variably restrict the other passage.

6. In a shock absorber, a relatively movable cylinder having heads and piston provided with a plurality of fluid passages, a piston rod passing through one of the heads, independent means for controlling the flow of fluid through said passages and including a valve stem for each passage extending slidably through the other head, the combined cross sectional areas of said stems being equal to the cross sectional area of the rod.

In testimony whereof, I affix my signature, in the presence of two witnesses.

FRANCIS V. PHILLIPS.

Witnesses:

GEO. H. CHANDLEE,

PHILIP F. LARNER.