

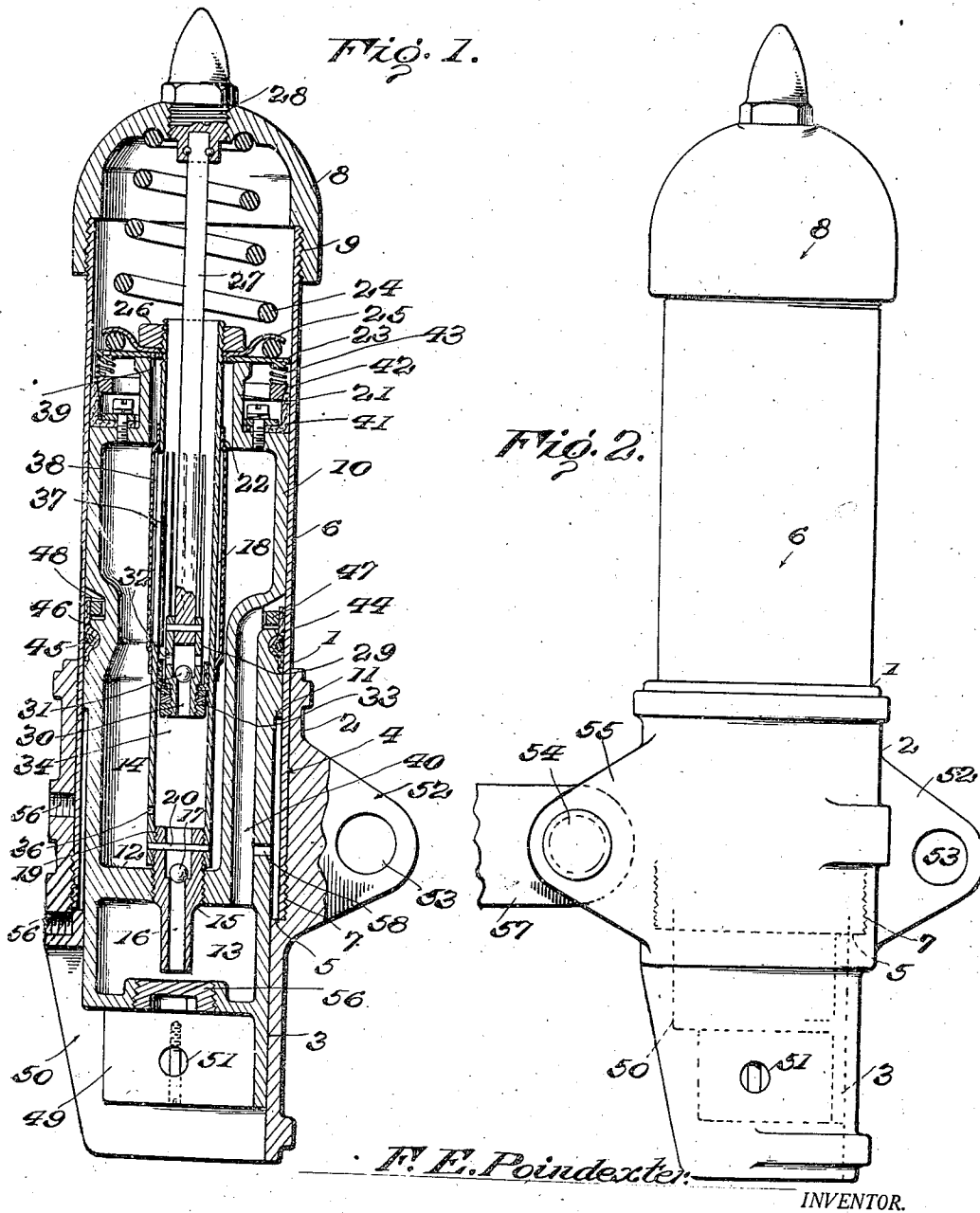
March 18, 1924.

F. E. POINDEXTER

1,487,597

SHOCK ABSORBER

Filed Nov. 16, 1920



BY

S. J. [Signature]
ATTORNEY.

UNITED STATES PATENT OFFICE.

FRANKLIN EMBRY POINDEXTER, OF ST. LOUIS, MISSOURI, ASSIGNOR, BY MESNE ASSIGNMENTS, TO BENJAMIN S. DAVIDSON, OF DENTON, TEXAS.

SHOCK ABSORBER.

Application filed November 18, 1920. Serial No. 424,490.

To all whom it may concern:

Be it known that I, FRANKLIN E. POINDEXTER, a citizen of the United States of America, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Shock Absorbers, of which the following is a specification.

This invention relates to an improvement in shock absorbers wherein a main pressure chamber is opened to the action of a pump operated in the relative movement of the parts of the shock absorber, to thereby vary the pressure in such main chamber in accordance with load conditions.

The present application is designed particularly as an improvement upon a co-pending application filed by me February 24, 1920, Serial No. 360,666, and in certain characteristic details tends to a simplification of construction and operation.

In the drawings:—

Fig. 1 is a vertical section of the improved shock absorber.

Fig. 2 is an elevation of the same showing a slightly modified form of support.

In the preferred construction illustrated, the shock absorber comprises what may be termed a casing 1, made up of a cast base 2 having a cylindrical bore 3 extending therethru. The upper portion of the bore is enlarged at 4, presenting a lower limit shoulder 5. A cylindrical shell 6 is fitted in and extends above the base, the shell being connected to the base preferably by the threaded connection 7, the lower edge of the shell resting upon the shoulder 5. The upper end of the shell is designed to receive a cap 8, which may be, and preferably is, removable thru a threaded connection 9.

A plunger 10 is slidably mounted within the shell 6 and base 2. The plunger comprises a hollow cylindrical body, the upper portion of which slidably fits the shell 6, while the lower portion slidably fits the base 2, the juncture between these respective portions of the plunger presenting a shoulder 11, which may cooperate with the shoulder 5 to limit one movement of the plunger relative to the shell.

The plunger which is hollow is divided by a transverse partition 12 near the lower end to thus provide a compartment 13 below said partition and a larger compartment 14, hereinafter termed the oil reser-

voir, above said partition. A valve nipple 15 is threaded thru a central opening in the partition 12, and has an interior reduced passage 16 opening near the bottom of the chamber 13. An upwardly opening valve 17 controls this passage, the passage being somewhat enlarged above the valve as shown. A pump cylinder 18 is secured to that portion of the valve nipple extending above the partition 12, being preferably threaded on the nipple as at 19 and further secured by a transverse pin 20, which also forms a limit for the upward movement of the valve.

The upper end of the plunger 10 is formed as a reduced upwardly extending neck 21, and the pump cylinder 18 passes thru and beyond this neck, there being a space 22 between the pump cylinder and neck. The upper end of the plunger is closed by a plate 23 on which is arranged the lower end of a coil spring 24. A spring retainer 25, engages the lower coils of such spring, and said retainer and plate 23 is held in position by a nut 26 threaded upon the upper end of the pump cylinder. When for any reason the air pressure within the main pressure chamber is not sufficient to support the load, the upper end of the spring 24 in contact with cap 8, and said spring assists in cushioning the relative movements of the plunger and casing, and enables the pumping action to take place. As the pressure increases, said spring is carried away from cap 8, the load being supported entirely by the air cushion.

A pump piston is operative in the pump cylinder 18, said piston including a rod 27 removably secured in a plug 28 closing an opening in the upper end of the cap 8. The rod 27 extends within the pump cylinder 18 and is provided at its lower end with a valve nipple 29 having a reduced passage 30 formed at the upper end to provide a valve seat controlled by an upwardly opening valve 31. The passage 30 above the valve communicates with the pump cylinder thru ports 32. A piston packing 33, of the usual cup washer formation is secured to and carried by the valve nipple 29, to thereby provide an operative pump piston within the cylinder 18. The lower portion of the pump cylinder 18 provides what may be termed a pump chamber 34, and this

chamber, at its lower end, is in communication with the oil reservoir 14 thru a small opening 36. Above the pump chamber, the wall of the pump cylinder is formed with a series of slots 37, and a tube 38 is secured to the exterior of the pump cylinder to cover the slotted area of such cylinder. Obviously in that stroke of the pump piston which carries such piston within the area of the slots 37, no pumping action will result, as the pressure equalizes around the piston thru the slots.

The closure plate 23 for the upper end of the plunger is formed with an opening or openings 39 whereby oil accumulating above the plunger may gradually find its way into the oil reservoir 14, this opening 39 also serving to permit gradual equalization of pressure above the plunger and within the oil reservoir.

The oil accumulating in the main pressure chamber above the plunger will lubricate the plunger in operation, there being formed in the body of the plunger a passage 40 opening thru the side of the plunger at the upper end and thru the partition 12 at the lower end whereby the excess oil finding its way between the plunger and casing will be delivered to the chamber 13.

Packing 41 is arranged between the upper end of the plunger and casing, said packing being secured to the upper end of the plunger outwardly of the neck 21 and having its marginal edge held in desired contact with the shell 6 of the casing by a spreading wedge ring 42 supported and positioned by springs 43 depending from the plate 23. A wiping packing 44 is arranged between the intermediate portion of the plunger and casing, such packing strip being secured to the plunger thru a spring ring 45 overlying the strip and forcing the same into a groove 46 in the plunger. The upper edge of the packing strip is held with desired pressure against the shell 6 of the casing by a spreading ring 47 seated in a channel 48 formed in the plunger. The oil that escapes by packing 41 is thus returned to chamber 13 from which it is pumped back into main pressure chamber.

That portion of the plunger extended below the bottom of the chamber 13 is partly cutaway, as at 49, and the corresponding portion of the base is similarly cutaway at 50, this permitting the introduction of the spring end to be connected. A spring connecting means for the plunger is shown at 51, while in the preferred form shown in Fig. 1, the base 2 is integrally formed with an outstanding ear 52 having an opening 53 whereby a brace rod to another air spring can be fastened. At 56 is shown threaded holes for bolting air springs to chassis of automobile.

The hole 53 serves as an air inlet to slid-

ing joint between main piston and part 2 being sufficiently loose to permit air to flow into space above shoulder 5.

The lower end of the chamber 13 is provided with a removable plug 56 for clean-out purposes.

In Fig. 2 is shown a hinged connection for securing the air spring to chassis, thus permitting the increase in length of car spring under compression and making the use of a shackle unnecessary. The connecting bar 54 is arranged for hinged connection between the ear 55 and the chassis 57.

The operation of the improved shock absorber is substantially similar to that described in the co-pending application referred to. At each relative movement of the plunger and casing, there is a resultant pumping action of the pump, and this without regard to the extent of such movement. Therefore the pressure in the main chamber above the plunger will at all times be automatically governed in accordance with load conditions. It will be understood that at each upward and suction stroke of the pump piston, there is a tendency to draw into the pump chamber, oil from the reservoir 14, but due to the restricted opening 36, the flow of the oil is insufficient to compensate for the suction and hence air from the atmosphere, together with some oil from the chamber 13 will be drawn into the pump chamber to compensate for the suction. On the return or pumping stroke of the piston, the tendency to displace the oil in the pump chamber is restricted by the opening 36, and hence such oil acts to a large extent as a base for the pump chamber, so that the air above this oil will be forced past the piston, that is past the valve 31 and thru the opening 32 and into the main pressure chamber. In that relative separation of the plunger and casing as will position the pump piston within the area of the slotted portion 37 of the pump cylinder, it is of course apparent that no pumping operation, that is no introduction of additional pressure into the main pressure chamber, will result, as the pressure is simply transferred around the piston due to the slots.

What I claim is:—

1. A fluid pressure device comprising a casing, a plunger therein, said plunger being formed to provide an oil reservoir, and a storage chamber arranged below such reservoir, pumping elements carried by the casing and plunger, an oil duct extending lengthwise the plunger and opening thru the side wall of the plunger at one end and into the storage chamber at the opposite end, said duct serving to transfer excess oil from between the plunger and casing to the storage chamber, and packing carried by the plunger to cooperate with the casing above and below the upper opening of the oil duct.

2. A fluid pressure device comprising a casing, a plunger movable therein, said plunger being hollow and formed with a centrally upwardly extending neck, a pump cylinder secured to the plunger and extending thru and spaced from the wall of said neck, a pump piston operating in the cylinder and secured to the casing, a plate closing the upper end of the plunger and formed with an opening to register with the space between the pump cylinder and neck, and plunger cushioning means secured at one end by said plate.
3. A fluid pressure device comprising a casing, a plunger movable therein, said plunger being hollow and formed with a centrally upwardly extending neck, a pump cylinder secured to the plunger and extending thru and spaced from the wall of said neck, a pump piston operating in the cylinder and secured to the casing, a plate closing the upper end of the plunger and formed with an opening to register with the space between the pump cylinder and neck, a spring arranged between the casing and plunger, a spring retainer, and means engaging the upper end of the pump cylinder to fix said retainer and plate in position.
4. A fluid pressure device comprising a casing, a plunger movable therein, a pump including a pump cylinder and piston operative in the relative movement of the casing and plunger for pumping action, said pump cylinder being formed throughout a determinate portion thereof with slots, whereby to prevent pressure action of the piston when working within the area of said slots.
5. A fluid pressure device comprising a casing, a plunger movable therein, a pump including a pump cylinder and piston operative in the relative movement of the casing and plunger for pumping action, said pump cylinder being formed thruout a determinate portion thereof with slots, and means for closing the slots beyond the cylinder.
6. A fluid pressure device comprising a casing, a plunger movable therein, a pump including a pump cylinder and piston operative in the relative movement of the casing and plunger for pumping action, said pump cylinder being formed thruout a determinate portion thereof with slots, and a plate secured to the exterior of the cylinder to overlie and close said slots.
7. A fluid pressure device, comprising a casing, a plunger movable therein, a pump including a pump cylinder and piston operative in the relative movement of the casing and plunger for pumping action, said pump cylinder being formed throughout a determinate portion thereof with slots, whereby to prevent pressure action of the piston when working within the area of said slots.

In testimony whereof I affix my signature.

FRANKLIN EMBRY POINDEXTER.